

Mark Scheme (Results)

Summer 2010

Principal Learning

Engineering
EG208 Exploring Engineering Innovation, Enterprise
and Technological Advancements

Edexcel is one of the leading examining and awarding bodies in the UK and throughout the world. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. Through a network of UK and overseas offices, Edexcel's centres receive the support they need to help them deliver their education and training programmes to learners.

For further information, please call our Diploma Line on 0844 576 0028, or visit our website at www.edexcel.com.

If you have any subject specific questions about the content of this Mark Scheme that require the help of a subject specialist, you may find our **Ask The Expert** email service helpful.

Ask The Expert can be accessed online at the following link:

<http://www.edexcel.com/Aboutus/contact-us/>

Summer 2010

Publications Code DP023789

All the material in this publication is copyright

© Edexcel Ltd 2010

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.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1(a)	<p>One mark for each correct answer only In this order (max 4)</p> <ul style="list-style-type: none"> • Designs • Trade Marks • Patents • Copyrights 	(4)

Question Number	Answer	Mark
1(b)	Trade Mark	(1)

Question Number	Answer	Mark
1(c)(i)	<ul style="list-style-type: none"> • © = Copyright (1) • associated paperwork (1) / manuals (1) / instructions (1) / packaging (1) / website text (1) <p>1 mark for each</p>	(2)

Question Number	Answer	Mark
1(c)(ii)	<p>One mark for each correct answer</p> <ul style="list-style-type: none"> • Write it down and date it (1) • Record it (1) • Post it to yourself (1) • Lodge it with solicitor (1) • Lodge it with bank (1) • Independent witness (1) <p>Any reasonable statement</p>	(3)

Question Number	Answer	Mark
2(a)	<p>Two mark for advantages, two marks for disadvantages (max 4)</p> <p>Advantages</p> <ul style="list-style-type: none"> • Lower interest rates (1) • Longer repayment period (1) • Able to borrow higher percentage of purchase (1) <p>Disadvantages</p> <ul style="list-style-type: none"> • Higher setup cost (1) • Risk of losing security (1) • May not have sufficient value in security (1) <p>Accept any reasonable answer</p>	(4)

Question Number	Answer	Mark
2(b)	<p>One mark for identifying each safety issue (max 2)</p> <ul style="list-style-type: none"> • Ensure cattle don't get stuck (1) • Ensure cattle don't get electric shock (1) • Ensure cattle don't starve (1) • Ensure feeder doesn't blow over (1) • Ensure materials are non-toxic (1) <p>Accept any reasonable health and safety answer</p>	(2)

Question Number	Answer	Mark
2(c)	<p>One mark for identifying method One mark for describing method x 2 (max 4)</p> <p>Pure research (1) Primary research (1) Activities that add to scientific knowledge (1) and may or may not have any immediate commercial application (1) Interviews(1) Questionnaires(1)</p> <p>Applied research (1) Secondary research (1) Directed towards a specific commercial objective (1)</p>	(4)

Question Number	Answer	Mark
3(a)	<p>One mark for each correct answer (max 2)</p> <ul style="list-style-type: none"> • Copper (1) • Zinc (1) 	(2)

Question Number	Answer	Mark
3(b)	<p>One mark for each correct answer (max 4)</p> <div style="text-align: center;">  </div> <div style="text-align: center; margin-top: 10px;"> <hr style="width: 100%; border: 1px solid black;"/> <p>Flat Bar / T Section Square Channel Plate / Strip</p> </div>	(4)

Question Number	Answer	Mark
3(c)	<p data-bbox="440 264 1005 297">One mark for each correct answer (max 4)</p> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <div style="border: 1px solid black; padding: 10px; width: 45%; text-align: center;">Strength</div> <div style="border: 1px solid black; padding: 10px; width: 45%; text-align: center;">The ability of a material to resist a force or stress without breaking</div> </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 20px;"> <div style="border: 1px solid black; padding: 10px; width: 45%; text-align: center;">Plasticity</div> <div style="border: 1px solid black; padding: 10px; width: 45%; text-align: center;">The ability of a material to withstand a sudden impact or force</div> </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 20px;"> <div style="border: 1px solid black; padding: 10px; width: 45%; text-align: center;">Toughness</div> <div style="border: 1px solid black; padding: 10px; width: 45%; text-align: center;">The ability of a material to return quickly to its original shape after being bent or deformed</div> </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 20px;"> <div style="border: 1px solid black; padding: 10px; width: 45%; text-align: center;">Elasticity</div> <div style="border: 1px solid black; padding: 10px; width: 45%; text-align: center;">The ability of a material to deform to a stretched state when a load is applied and retain its change in shape after the load is removed</div> </div> </div>	(4)

Question Number	Answer	Mark
3(d)	<p>One mark for definition, Three marks for description (max 4)</p> <p>Definition</p> <ul style="list-style-type: none"> ○ a heat treatment process (1) ○ a process to soften the material (1) ○ to heat treat metal (1) <p>Description</p> <ul style="list-style-type: none"> • Warm up metal (1) and cool down (1) slowly (1) • To soften the steel (1) and to improve machinability. (1) • To relieve internal stresses (1) induced by some previous treatment (1) (rolling, forging, uneven cooling). (1) • To remove coarseness of grain. (1) <p>Combination</p> <p>A process in which metals and other materials are treated to render them less brittle and more workable. (3)</p>	(4)

Question Number	Answer	Mark
4(a)	<p>Properties</p> <ul style="list-style-type: none"> • easy to produce (1) • non corrosive (1) • non-toxic (1) • light-weight (1) • durable (1) • strong (1) 	(2)

Question Number	Answer	Mark
4(b)	<p>Material</p> <ul style="list-style-type: none"> • stainless steel (1) • aluminium (1) • PVC (1) • ABS (1) • Carbon fibre (1) • PP (1) <p>Accept any reasonable polymer If answer in (a) is inappropriate allow follow through for appropriate material</p>	(1)

Question Number	Answer	Mark
4(c)	<p>Advantages</p> <ul style="list-style-type: none"> • Cheap (1) • Waterproof (1) • Strong (1) • Recyclable (1) • Easy to manufacture (1) • Resistant to corrosion (1) <p>Disadvantages</p> <ul style="list-style-type: none"> • Expensive (1) • Difficult to manufacture (1) <p>Any reasonable answer If answer in (b) is inappropriate allow follow through up to two marks if advantages/disadvantages are relevant to material</p>	(3)

Question Number	Answer	Mark
5(a)(i)	<p>One mark for impact One mark for reduction</p> <p>Production Process Impact</p> <ul style="list-style-type: none"> • Poor waste techniques can produce waste product (1) • Production waste may go into landfill sites further releasing greenhouse gases (1) • Many industrial manufacturing processes use vast quantities of energy (gas, oil, coal) (1) • Production process often have a heavy carbon footprint (1) <p>Production Process Reduction:</p> <ul style="list-style-type: none"> • Design the product to fit closely with existing forms or supply of raw material (sheet steel, box section, etc) (1) • Reduce waste in the product process (1) • Source raw materials from a closer geographical position (1) • Choose materials that come from efficient production processes (1) • Use materials that come from sustainable sources (1) • Use recycled materials (1) • Use green production process that themselves use sustainable energy and are efficient (1) • Control process to reduce waste (1) <p>Accept any reasonable answer</p>	(2)

Question Number	Answer	Mark
5(a)(ii)	<p>One mark for impact One mark for reduction</p> <p>Raw Materials and Transport Impact</p> <ul style="list-style-type: none"> • Carry a heavy carbon footprint (1) • Geographical position in the world (1) • Production/mining techniques (1) • Expensive to move goods (1) • High transport cost (1) • Petrol/diesel prices are expensive (1) • Transport produces pollution (1) • Transport increases global warming (1) • Transport costs often outstrip the cost of producing the product (1) • Transport emissions damage the environment (1) • Ships, planes, trains or lorries pollute (1) • Finished goods could carry a high carbon footprint (1) <p>Raw Material and Transport Reduction</p> <ul style="list-style-type: none"> • Source raw materials from closer geographical position (1) • Choose materials that come from efficient production processes (1) • Choose materials that come from sustainable production processes (1) • Choose recycled materials (1) • Less distribution (1) • Choose locally produced materials (1) • Use of 'green' transport (1) • Minimise movement of goods (1) • Explore other forms of transport i.e. waterways (1) or electric (1) • Consider small production centres/plants (1) closer to customers (1) <p>Accept any reasonable answer</p>	(2)

Question Number	Answer	Mark
5(b)	<p>Evaluation to contain (max 6)</p> <p>Strengths</p> <ul style="list-style-type: none"> • Reduce carbon emissions (1) • Reduce use of grid electricity (1) • Reduce farmers transport costs and travelling to feed cattle (1) • Free energy (1) • Less pollution (1) <p>Weakness</p> <ul style="list-style-type: none"> • Expensive to produce cattle-fed (1) • More complicated technology (1) • Expensive to repair (1) • Will not work without wind or sunshine (1) <p>Conclusion</p> <ul style="list-style-type: none"> • On balance the idea is good (1) • On balance the idea is bad (1) <p>Award up to 3 marks from conclusion mapped to evaluation argument</p> <p>Accept any evaluation containing reasonable environmental theme</p>	(6)

Question Number	Answer	Mark
6(a)	<p>Advantages</p> <ul style="list-style-type: none"> • Solar/Wind - More choice of installation sites (1) • Solar/Wind/Hydro - Free energy (1) • Solar/Wind/Hydro/Nuclear - Renewable energy source (1) • Solar/Wind/Hydro/Nuclear - Sustainable energy (1) <p>Disadvantages</p> <ul style="list-style-type: none"> • Solar/Wind - Will not work without wind or sunshine (1) • Solar/Wind/Hydro/Nuclear - More expensive than conventional fossil fuel power stations to build (1) • Solar/Wind/Nuclear - More complicated technology than conventional (1) • Hydro-electric - May involve environmental damage (1) • Nuclear - Waste product storage (1) <p>Comparison Example</p> <ul style="list-style-type: none"> • Wind is better than nuclear (1) • With regard to commissioning costs, nuclear power is substantially higher than wind and solar power generation and nuclear does have waste to be disposed of, however wind and solar produce very little power in comparison (3) <p>Award up to 3 marks for more detailed comparison Accept any reasonable answer</p>	(5)

Question Number	Answer	Mark
6(b)	<p>Reduce energy consumption</p> <p>Component parts could:</p> <ul style="list-style-type: none"> • Be made from locally sourced materials (1) • Be made out of recycled materials (1) • Use materials that closely match the size and shape of stock available (1) • Be made in energy efficient factories (1) • Be made by energy efficient equipment (1) • Be made by equipment powered by sustainable energy (1) • Be made in factories powered by sustainable energy (1) • Produce very little waste (1) <p>Accept any reasonable answer</p>	(5)

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467
Fax 01623 450481

Email publications@linneydirect.com

Order Code DP023789 Summer 2010

For more information on Edexcel qualifications, please visit www.edexcel.com/quals

Edexcel Limited. Registered in England and Wales no.4496750
Registered Office: One90 High Holborn, London, WC1V 7BH