

# Mark Scheme (Results)

June 2012

Principal Learning

Engineering  
EG208 Paper 01

Exploring Engineering Innovation,  
Enterprise and Technological  
Advancements

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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 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
<b>1(a)(i)1</b>	<ul style="list-style-type: none"> <li>• Patent</li> <li>• Patents</li> </ul> <p>Accept any recognisable spelling (phonetic) of the above answer.</p> <p style="text-align: right;">(1 X 1)</p>	<b>(1)</b>

Question Number	Answer	Mark
<b>1(a)(i)2</b>	<ul style="list-style-type: none"> <li>• Trademarks</li> <li>• Trademark</li> <li>• Trade mark</li> </ul> <p>Accept any recognisable spelling (phonetic) of the above answer.</p> <p style="text-align: right;">(1 x1)</p>	<b>(1)</b>

Question Number	Answer	Mark
<b>1(a)(ii)</b>	<p>Design - Protect the visual appearance (1) or eye appeal of the product (1)</p> <p>Copyright – Protects material (1) such as art (1), music (1), sound recordings (1) technical literature (1) - any two.</p> <p style="text-align: right;">(2 x 2)</p>	<b>(4)</b>

Question Number	Answer	Mark
<b>1(b)</b>	<ul style="list-style-type: none"> <li>• Copyright</li> <li>• Copy right</li> </ul> <p>Accept any recognisable spelling (phonetic) of the above answer.</p> <p style="text-align: right;">(1 x 1)</p>	<b>(1)</b>

Question Number	Answer	Mark
<b>1(c)</b>	<ul style="list-style-type: none"> <li>• The Intellectual Property Office</li> <li>• IPO</li> <li>• IPO.gov.uk</li> <li>• Patent office</li> </ul> <p style="text-align: right;">(1 x 1)</p>	<b>(1)</b>

Question Number	Answer	Mark
<b>1(d)</b>	<p>One mark for each reason</p> <ul style="list-style-type: none"> <li>• Gives SolarNRG the rights for the look of the product (1)</li> <li>• Stop someone copying the design (1)</li> <li>• SolarNRG can sell the design (1)</li> <li>• SolarNRG can licence the design (1)</li> <li>• Acknowledged for good idea (1),</li> <li>• Legally stop others from using idea (1) without permission (1)</li> <li>• Able to sell product for financial gain (1)</li> <li>• Charge others to use idea (1)</li> </ul> <p>Accept any reasonable response</p> <p style="text-align: right;">(2 x 1)</p>	<b>(2)</b>

Question Number	Answer	Mark
<b>1(e)</b>	<p>One mark for each type</p> <ul style="list-style-type: none"> <li>• Lines (1)</li> <li>• Contours (1)</li> <li>• Colours (1)</li> <li>• Texture (1)</li> <li>• Materials (1)</li> <li>• Ornamentation of product/unique appearance (1)</li> <li>• Pattern (1)</li> </ul> <p>Accept other appropriate visual features</p> <p style="text-align: right;">(2 x 1)</p>	<b>(2)</b>

Question Number	Answer	Mark
<b>2(a)</b>	<p>One mark for identifying each type of market research (max 4)</p> <ul style="list-style-type: none"> <li>• Establish what similar products are available (1)</li> <li>• Customer questionnaire (1)</li> <li>• Price comparison (1)</li> <li>• Carry out a customer survey (1)</li> <li>• Establish who would buy the product (1)</li> <li>• Carry out a trial test with a group of customers (1)</li> <li>• Determine demand for the product (1)</li> <li>• Is there a large enough market for mass production (1)</li> <li>• Predict quantity of unit sales (1)</li> <li>• Survey shops that may want to sell the product (1)</li> <li>• Survey (1)</li> <li>• Working model/prototype (1)</li> <li>• Appropriate material research/investigation (1)</li> </ul> <p>Accept any reasonable market research activity (4 x 1)</p>	<b>(4)</b>

Question Number	Answer	Mark
<b>2(b)</b>	<p>One mark for identification, one mark for description x 2 (max 4)</p> <ul style="list-style-type: none"> <li>• Make a prototype (1) which could be a working model (1)</li> <li>• Test for operation (1) through reliability /durability testing (1)</li> <li>• Ensuring it meets standards (1) through legal compliance testing (1)</li> <li>• Usability testing (1) through trial customer feedback (1)</li> <li>• Testing for ease of control (1) through ergonomic testing (1)</li> </ul> <p>Accept any reasonable description of generic or specific pre-production tests including materials testing. Can accept more than one test across the two answers.</p> <p>(2 x 2)</p>	<b>(4)</b>

Question Number	Answer	Mark
<b>2(c)</b>	<p>Loan – commercial – interest; owe more than 100k; may be secured against property i.e. mortgage which could result in repossession of assets.  e.g. If business not successful then money will still need to be repaid. Loan usually secured against an asset so will lose asset if business fails. Will be charged a higher rate of interest</p> <p>Grant – ‘gift’ – may be implications  e.g. May be tied to producing written evidence of business success. Will not necessarily have to pay them money back. Agreement may have penalty clauses with part of the money having to be repaid if business not successful.</p>	<b>(4)</b>

Question Number	Answer	Mark												
3(a)	<p data-bbox="391 266 847 297">One mark for each correct line</p> <div data-bbox="432 369 1145 1064"> <table border="0" style="width: 100%; text-align: center;"> <thead> <tr> <th data-bbox="472 369 611 400">Material</th> <th data-bbox="871 369 1062 400">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="437 472 671 533">Brass</td> <td data-bbox="748 448 1145 528">Grey colour, strong in compression, ferrous</td> </tr> <tr> <td data-bbox="437 577 671 638">ABS</td> <td data-bbox="748 562 1145 642">Yellow/gold colour, copper and zinc alloy, non-ferrous</td> </tr> <tr> <td data-bbox="437 696 671 757">Copper</td> <td data-bbox="748 680 1145 761">Black colour, lightweight, expensive</td> </tr> <tr> <td data-bbox="437 815 671 875">Cast iron</td> <td data-bbox="748 790 1145 893">Available in a variety of colours, high-impact strength, can be moulded, warm to touch</td> </tr> <tr> <td data-bbox="437 943 671 1003">Carbon Fibre</td> <td data-bbox="748 927 1145 1064">Reddish brown colour, very soft and ductile, good electrical conductor, non-ferrous</td> </tr> </tbody> </table> <p data-bbox="391 1120 1114 1189">No mark for any description linked to more than one material.</p> <p data-bbox="1070 1189 1161 1220" style="text-align: right;">(5 x1)</p> </div>	Material	Description	Brass	Grey colour, strong in compression, ferrous	ABS	Yellow/gold colour, copper and zinc alloy, non-ferrous	Copper	Black colour, lightweight, expensive	Cast iron	Available in a variety of colours, high-impact strength, can be moulded, warm to touch	Carbon Fibre	Reddish brown colour, very soft and ductile, good electrical conductor, non-ferrous	<b>(5)</b>
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Question Number	Answer	Mark
<b>3(b)(i)</b>	<ul style="list-style-type: none"> <li>• Elasticity</li> <li>• Elastic</li> </ul> <p>Accept any recognisable spelling (phonetic) of the above answer. Do not accept 'plastic' or 'elastomer'</p> <p style="text-align: right;">(1 x 1)</p>	<b>(1)</b>

Question Number	Answer	Mark
<b>3(b)(ii)</b>	<ul style="list-style-type: none"> <li>• Hardness</li> <li>• Hard</li> </ul> <p>Accept any recognisable spelling (phonetic) of the above answer.</p> <p style="text-align: right;">(1 x 1)</p>	<b>(1)</b>

Question Number	Answer	Mark
<b>3(c)</b>	<ul style="list-style-type: none"> <li>• Acrylonitrile-Butadiene-Styrene (ABS) (1)</li> <li>• Nylon (PA) (1)</li> <li>• Polycarbonate (PC) (1)</li> <li>• Polypropylene (PP) (1)</li> <li>• Polystyrene (PS) / High impact polystyrene (HIPS)(1)</li> <li>• High-density polyethylene (HDPE) (1)</li> <li>• Polyvinyl chloride (PVC) (1)</li> <li>• Rubber (1)</li> </ul> <p>Do not accept 'plastic', 'thermoplastic' or 'thermoset'</p> <p>Accept any recognisable spelling (phonetic) of the answers above</p> <p style="text-align: right;">(1 x 1)</p>	<b>(1)</b>

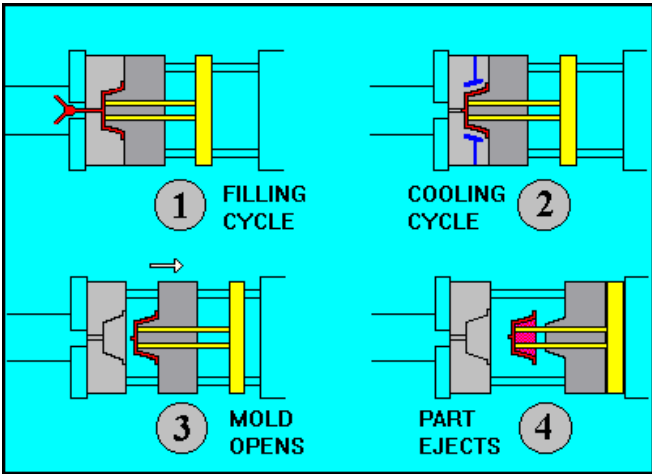
Question Number	Answer	Mark
<b>3(d)(i)</b>	<p>A ceramic material</p> <ul style="list-style-type: none"> <li>• Hard, brittle material (1)</li> <li>• Made from non metallic minerals (1)</li> <li>• Produced by firing at high temperatures (1)</li> <li>• Have a crystalline structure (1)</li> <li>• Have a part crystalline structure (1)</li> <li>• Wear/abrasion resistant (1)</li> </ul> <p>E.g. A ceramic is an inorganic , non metallic solid (1) prepared by the action of heating and then cooling (1)</p> <p>Accept examples of ceramic materials up to one mark.</p> <p style="text-align: right;">(2 x 1)</p>	<b>(2)</b>

Question Number	Answer	Mark
<b>3(d)(ii)</b>	<p>Composite material</p> <ul style="list-style-type: none"> <li>• Strong, lightweight material (1)</li> <li>• Fibres bonded together (1)</li> <li>• Made up of two or more materials (1)</li> <li>• Combines properties of more than one material (1)</li> </ul> <p>E.g. Composite are made from two or more materials (1) to produce a material that combines the properties of both (1)</p> <p style="text-align: right;">(2 x 1)</p>	<b>(2)</b>

Question Number	Answer	Mark
<b>4(a)</b>	<p>One mark for identifying advantage, 1 mark for expansion up to two marks</p> <p>In the home</p> <ul style="list-style-type: none"> <li>• Lower your energy bills (1)</li> <li>• Protect against future electricity price increases (1)</li> <li>• Reduce your household carbon emissions (1)</li> <li>• Does not emit any harmful emissions (1)</li> <li>• Reduce the need for fossil fuels (1)</li> <li>• Generates clean, inflation proof electricity (1)</li> <li>• Reduce carbon footprint (1)</li> <li>• Sell surplus to grid (1)</li> </ul> <p>If same advantage identified in (b) and (c), marks can only be awarded if expansion is appropriate for environment.</p> <p style="text-align: right;">(1 x 1) (1 x 1)</p>	<b>(2)</b>

Question Number	Answer	Mark
<b>4(b)</b>	<p>One mark for identifying advantage, 1 mark for expansion up to two marks</p> <p>In the workplace</p> <ul style="list-style-type: none"> <li>• More energy efficient (1)</li> <li>• Lower costs (1)</li> <li>• Reduce carbon footprint (1)</li> <li>• Sustainability (1)</li> <li>• Generates clean, inflation proof electricity (1)</li> <li>• Could increase the value of your development (1)</li> <li>• Differentiates yourself from your competitors (1)</li> <li>• Creates an environmental brand name (1)</li> <li>• Meets corporate social responsibility needs (1)</li> <li>• Increases stakeholder confidence in your investments (1)</li> </ul> <p>If same advantage identified in (a) and (c), marks can only be awarded if expansion is appropriate for environment.</p> <p style="text-align: right;">(1 x 1) (1 x 1)</p>	<b>(2)</b>

Question Number	Answer	Mark
4(c)	<p>One mark for identifying advantage, 1 mark for expansion up to two marks</p> <p>In the built environment</p> <ul style="list-style-type: none"> <li>• Reduce global warming (1)</li> <li>• Cost effective due to large scale projects (1)</li> <li>• Lower emissions (1)</li> <li>• Elegant solution for the renewable generation (1)</li> <li>• It is technically proven (1)</li> <li>• UK feed-in tariffs will make it very attractive (1)</li> <li>• Not disruptive in terms of noise or emissions (1)</li> <li>• Large scale sustainability (1)</li> <li>• Provide good example for society (1)</li> </ul> <p>If same advantage identified in (a) and (b), marks can only be awarded if expansion is appropriate for environment.</p> <p style="text-align: right;">(1 x 1) (1 x 1)</p>	<p style="text-align: right;"><b>(2)</b></p>

Question Number	Answer	Mark
5	<p>Explanation</p> <ul style="list-style-type: none"> <li>• Warm up plastic (1) in a mould (1)</li> <li>• Heat up plastic (1) and pour (1) into mould (1)</li> <li>• Warm up plastic (1) and force (1) into a mould (1)</li> <li>• Heat plastic (1) and inject (1) into mould (1)</li> </ul> <p>E.g. A moulding procedure whereby granules of plastic (1) are fed into a hopper (1). The heat-softened (1) plastic material is then forced (1) from a cylinder into a relatively cool (1) cavity which gives the article the desired shape (1).</p>  <p>Accept any appropriate answer Do not accept the process of vacuum forming.</p> <p style="text-align: right;">(6 x 1) (1 x 6) <b>(6)</b></p>	

Question Number	Answer	Mark
6(a)	<p>Sustainable forms of energy</p> <ul style="list-style-type: none"> <li>• Wind power (1)</li> <li>• Nuclear power (1)</li> <li>• Geothermal (1)</li> <li>• Tidal (1)</li> <li>• Hydro (1)</li> <li>• Biomass (1)</li> <li>• Wave generation (1)</li> </ul> <p>Do not accept 'solar energy'.</p> <p style="text-align: right;">(2 x 1) <b>(2)</b></p>	

Question Number	Answer	Mark
<b>6(b)</b>	<p data-bbox="421 210 1214 241">Award up to 2 marks for outline of process operation</p> <p data-bbox="421 282 1187 383">e.g. Wind power – turbines with large blades / propellers that are turned by the wind. This turns a generator to create electricity.</p> <p data-bbox="421 423 1211 454">1 mark for simple statement, 1 mark for linked point</p> <p data-bbox="421 495 596 526">Advantages</p> <ul data-bbox="472 530 1219 1059" style="list-style-type: none"> <li>• Solar/Wind - More choice of installation sites (1)</li> <li>• Solar/Wind/Hydro - Free energy (1)</li> <li>• Solar/Wind/Hydro/Nuclear – Renewable energy source (1)</li> <li>• Geothermal – free energy (1) an abundance of volcanic rocks (1) no carbon emissions (1)</li> <li>• Biomass – energy comes from natural plants (1) abundance of plants available (1) cheap (1) easy to create energy (1)</li> <li>• Solar – free energy (1) generates energy quickly (1) no carbon emissions (1) wide variety of applications (1)</li> <li>• Solar/Wind/Hydro/Nuclear – Sustainable energy (1)</li> </ul> <p data-bbox="421 1099 639 1131">Disadvantages</p> <ul data-bbox="472 1135 1203 1664" style="list-style-type: none"> <li>• Solar/Wind - Will not work without wind or sunshine (1)</li> <li>• Solar/Wind/Hydro/Nuclear - More expensive than conventional fossil fuel power stations to build (1)</li> <li>• Solar/Wind/Nuclear - More complicated technology than conventional (1)</li> <li>• Hydro-electric – May involve environmental damage (1)</li> <li>• Nuclear – Waste product storage (1)</li> <li>• Biomass – kills natural habitat/wildlife (1) increasing carbon dioxide in atmosphere (1)</li> <li>• Geothermal – Expensive process to set up (1) high maintenance costs (1) specific to certain landscapes/environments (1)</li> </ul> <p data-bbox="421 1704 743 1736">Comparison example:</p> <ul data-bbox="472 1740 1206 2018" style="list-style-type: none"> <li>• Wind is better than nuclear (1), however wind power can be very noisy close to turbines (1)</li> <li>• With regard to commissioning costs, nuclear power is substantially higher (1) than wind and solar power generation (1)</li> <li>• Nuclear does have waste to be disposed of (1), however wind and solar produces very little power in comparison (1)</li> </ul> <p data-bbox="1118 2022 1219 2054" style="text-align: right;">(2 x 2)</p>	<b>(4)</b>

Question Number		Indicative Content
<b>6(c)</b>		<p>All manufacturers need to think about the energy consumed when making their products. The SolarCut components could be made from locally sourced materials, which involve less transport. There needs to be consideration of the use of recyclable materials and materials that closely match the size and shape of the stock available to avoid over-wastage.</p> <p>Manufacturers need to ensure that factories are energy efficient and use energy efficient machinery and equipment to reduce energy consumption, preferably using sustainable sources of energy and producing as little waste as possible. Other energy reduction schemes could be used, such as automatic lighting systems, stand-by mode on electrical equipment.</p>
Level	Mark	Descriptor
	<b>0</b>	No rewardable material
<b>1</b>	<b>1-2</b>	Identification of at least two factors that impact on energy consumption around the production activities or brief explanation of one impact.
<b>2</b>	<b>3-4</b>	Detailed explanation of at least two factors that impact on energy consumption in a wider sense, or detailed explanation of one impact.
<b>3</b>	<b>5-6</b>	Full explanation of two or more factors that impact on energy consumption and associated conservation strategies within the manufacturing environment.

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