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Mark Scheme (Results)

January 2010

Principal Learning

Engineering EG208
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
1(a)	C	**(1)**

Question Number	Answer	Mark
1(b)	Design	**(1)**

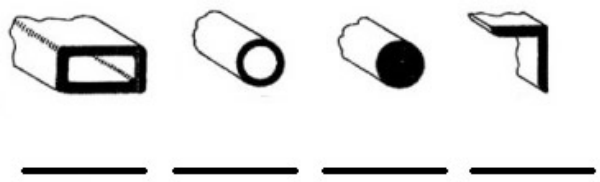
Question Number	Answer	Mark
1(c)	One mark for correct answer (max 1) • UK Patent Office/department/organisation • Patent Office/department/organisation *Do not accept UK patent/patent on it's own.*	**(1)**

Question Number	Answer	Mark
1(d)	One mark for each correct answer (max 3) • Stop the idea being stolen (1) • Stop the idea being copied (1) • Stop the idea being commercially exploited by others (1) • To legally protect the idea (1) • To be able to make money from the idea (1) • To franchise the idea.(1) • Earn royalties (1) • Claim legal ownership (1) • Place on a national database (1) • Prove she came up with the idea first (1) Any reasonable advantage	**(3)**

Question Number	Answer	Mark
2(a)	One mark for identifying each type of market research (max 4) • Establish what similar products are available (1) • Customer questionnaire (1) • Price comparison (1) • Carry out a customer survey (1) • Establish who would buy product (1) • Carry out a trial test with a group of customers (1) • Determine demand for the product (1) • Is there a large enough market for mass production (1) • Predict quantity of unit sales (1) • Survey shops that may want to sell the product (1) • Survey (1) • Working model/proto type (1) Accept any reasonable market research activity	**(4)**

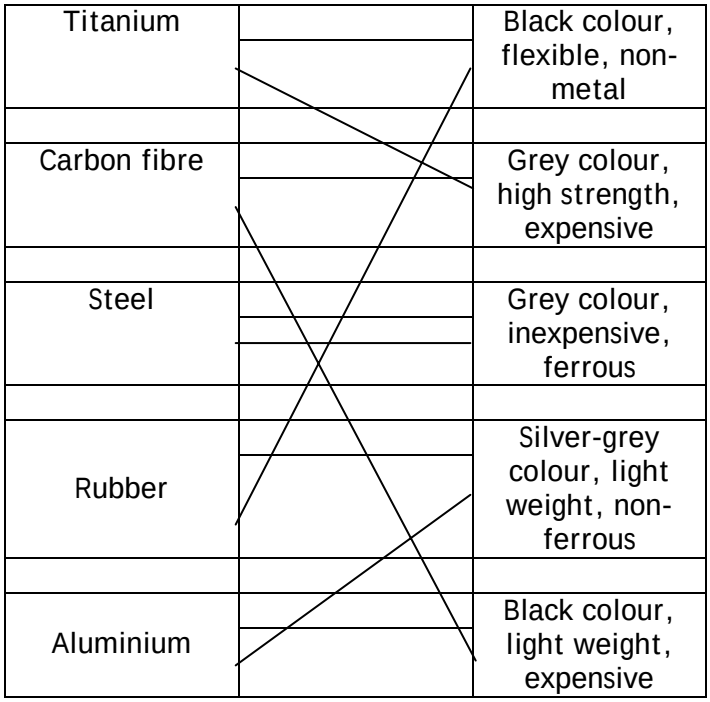
Question Number	Answer	Mark
2(b)	One mark for each correct answer (max 4) • Banks (1) • Building societies (1) • Grants / Princes Trust / National Lottery (1) • Private finance (1) • Own money / Work for money (1) • Venture capitalists (1) • Friend and family (1) • Stakeholders (1) • Shares in the company (1) • Fundraiser / Charity event (1) • Sponsorship (1) • Take out a loan (1) • Partnership (1) Accept any reasonable answer No marks for 'Dragons Den' – unless they clarify venture capitalists. Do not accept 'government'.	**(4)**

Question Number	Answer	Mark
2(c)	One mark for identifying, one mark for description x 2 (max 4) • Make a prototype (1) which could be a working model (1) • Test for operation (1) through reliability / durability testing (1) • Ensuring it meets standards (1) through legal compliance testing (1) • Usability testing (1) through trial customer feedback (1) • Testing for ease of control (1) through ergonomic testing (1) Accept any reasonable description of generic or specific pre-production tests including materials testing. Can accept more than one test across the two answers.	**(4)**

Question Number	Answer	Mark
3(a)	One mark for each correct answer (max 4)  Box/ RHS Pipe/Tube/ Tubular Round/Rod/ Bar Angle Conduit not acceptable. If the word section is included with any of the above answers one mark should be awarded in each case.	**(4)**

Question Number	Answer	Mark
3(b)	One mark for correct answer (max 2) • Aluminium (1) • Brass (1) • Copper (1) • Stainless Steel (1) • Nickel (1) • Tin (1) • Silver (1) • Gold (1) • Lead (1) • Bronze (1) • Titanium (1) • Chromium (1) • Zinc (1) • Phosphor Bronze (1) Accept any of the above if the word alloy is included. Do not accept alloy on it's own.	**(2)**

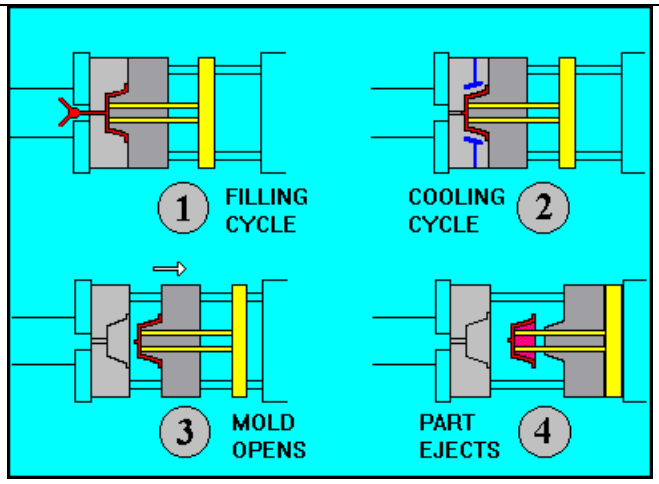
Question Number	Answer	Mark
3(c)	Thermoplastic	**(1)**

Question Number	Answer	Mark
3(d)	One mark for each correctly linked box (max 5)  No mark for lines from the materials to more than one box.	**(5)**

Question Number	Answer	Mark
4(a)	1 mark for the term 4 marks for the outline Term Alloying • Metal modified by mixing with other metals (1) • Mixing metals (1) Mix molten metal (1) with other metals or non-metal materials in a crucible (1) in proportions by weight/volume, (1) take samples (1), cool it, test it (1), make final adjustments to the mixture and cast (1). Any reasonable answer	**(5)**

Question Number	Answer	Mark
4(b)	Statements must be explained. Advantages: To change the characteristics (1) or properties of a pure base metal (1) To improve the mechanical (1) or electrical properties of a base metal (1) To form a new complete solid metal structure (1) To enhance the base metal in some way (1) Alloying one metal with other metal(s) or non metal(s) often enhances its properties (2) More strength (1) Increase strength/weight ratio (1) Improve appearance (1) Improve machinability (1) Increase corrosion resistance (1) Decrease production cost (1) Disadvantages: Increase production cost (1) Increase material cost (1) Increase manufacturing time (1) The process of alloying creates pollutants (1) Increased energy costs (1) Environmental effects (1) For full marks both advantages and disadvantages must be covered. If only one is covered, a maximum of four marks to be awarded.	**(5)**

Question Number	Answer	Mark
5	Sustainable polymer PVC (1) ABS (1) PP (1) LDPE (1) HDPE (1) PET (1) PS (1) UPVC (1) PPVC (1) Thermoplastic (1) Thermosetting (1) Up to a maximum of one mark. Properties Strong (1) Durable (1) Lightweight (1) Inexpensive (1) Non-corrosive (1) Malleable (1) Ductility (1) Up to a maximum of three marks. Explanation Warm up plastic (1) in a mould (1) Heat up plastic (1) and pour (1) into mould (1) Put fiberglass (1) and resin in mould (1) Warm up plastic (1) and force (1) into a mould (1) Heat plastic (1) and inject (1) into mould (1) The process of forming a material by forcing (1) it from a heated cylinder (1), under pressure (1), through a spur into a cavity of a confined mould (1). A moulding procedure whereby a heat-softened (1) plastic material is forced (1) from a cylinder into a relatively cool (1) cavity which gives the article the desired shape (1). Diagram	**(10)**

	 Up to a maximum of three marks for the diagram. Any reasonable answer	

Question Number	Answer	Mark
6(a)	One mark for a correct answer in each section (max 3) Use of Material • Sustainable materials (1) • Unsustainable materials (1) • Mining implications (1) • Transport implications (1) • Recyclable (1) • Reusable (1) Waste Disposal • Poor production techniques can produce waste product (1) • Waste may go into landfill (1) sites further releasing green house gases (1) • Design the product to fit closely with existing forms or supply (1) of raw material (1) (sheet steel, box section, etc) to reduce waste in the product process (1) • Control the manufacturing process (1) to reduce waste (1) Energy Efficiency • Many industrial manufacturing process use vast quantities of energy (gas, oil, coal) (1) • Production process often has a heavy carbon footprint (1) • Use green production process that themselves use sustainable energy and are efficient (1) Accept any appropriate reasonable response	**(3)**

Question Number	Answer	Mark
6(b)	One mark for each correct identification of theme and one mark for explanation (2 x 2)(max 4) • Reduction in energy consumption (1) • Using Pack-a-Bike as transport will reduce the energy used to extract raw materials (1) such as coal gas and oil (1) • Using Pack-a-Bike transport will reduce the energy used to refine oil (1) • Using Pack-a-Bike transport will reduce the energy used (1) to transport fossil fuel (1) • Using Pack-a-Bike will compared with cars will reduce the damage to roads and infrastructure (1) • Using Pack-a-Bike roads will last longer (1) and need less maintenance (1) • Pack-a-bike will produce less pollution than motor vehicles (1) • The Pack-a-Bike product is recyclable (1) • Using Pack-a-Bike will reduced carbon emissions (1) from traditional energy generation (1) • Using green transport reduces the demands placed on our world resources (1) such as coal, gas and oil (1) • Less pollution in towns and cities will improve the populations health (1) • Exercise gained by using Pack-a-Bike will improve the users' health (1) • Transportable/on to public transport (1) • Being sociable and meeting people/getting out in groups.(1) Do not accept social on it's own. Accept any explanation containing reasonable social theme	**(4)**

Question Number	Answer	Mark
6(c)	3 marks for explanation Recycling • Frame made out of recyclable alloy (1) • Mudguards made from recyclable polymer (1) • Use recyclable materials (1) • Recycle waste to reduce waste disposal (1) • Offer end-of-life recycling service (1) • Sustainable joining methods (1) • Reconditioning service (1) • Use same type of polymer throughout (1) • Don't use paint on the frame (1) • Don't chrome plate parts (1) Any reasonable explanation	**(3)**

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