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Mark Scheme (Results)

January 2013

Principal Learning

Engineering
EG208 Paper 01

Exploring Engineering Innovation, Enterprise and Technological Advancements

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January 2013
Publications Code DP034397

General Marking Guidance

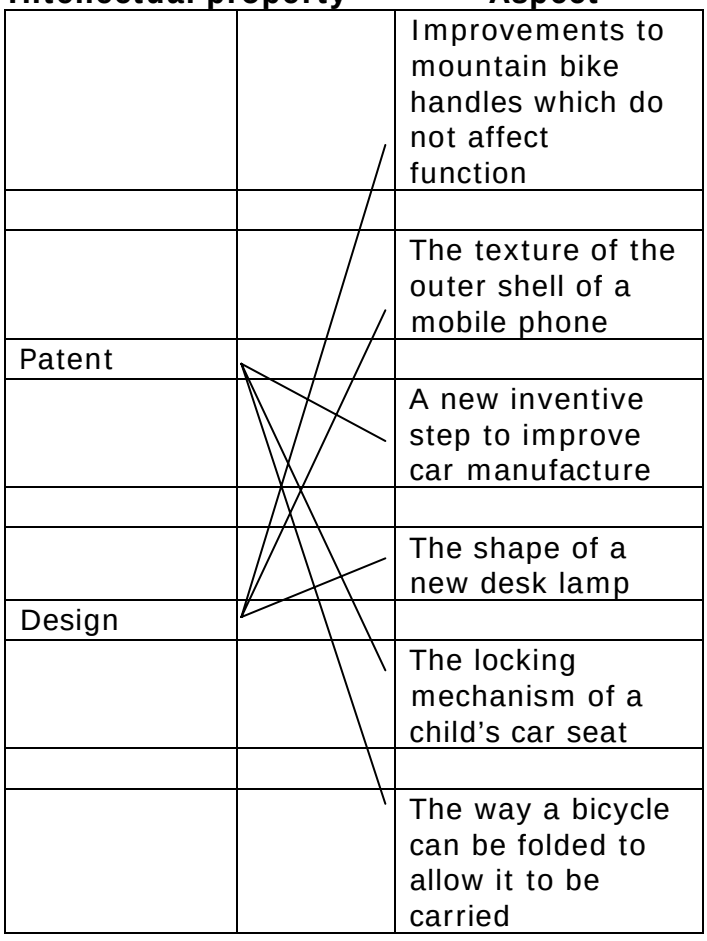
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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)	B	**(1)**

Question Number	Answer	Mark
1(b)	Patent Accept any recognisable spelling (phonetic) of the above answer.	**(1)**

Question Number	Answer	Mark
1(c)	Three from the following answers • Using the internet (1) • By application number (1) • By document name (1) • By publication number (1) • Patent validity search (1) • Freedom to operate/FTO search (1) • Grant assessment searches (1) • Expert search databases (1) • Searching patent journals (1) • Checking the database of patent endorsed license of right/LOR (1) • Checking the database of green channel applications/GCP (1) • Contacting the IP office (1) Accept any reasonable response (3 x 1)	**(3)**

Question Number	Answer	Mark
1(d)	• Trademark • TM • Registered trademark • Reg. trademark Do not accept ‘registered’ on its own (1 x 1)	**(1)**

Question Number	Answer	Mark
1(e)	**Intellectual property** **Aspect**  Improvements to mountain bike handles which do not affect function The texture of the outer shell of a mobile phone Patent A new inventive step to improve car manufacture The shape of a new desk lamp Design The locking mechanism of a child's car seat The way a bicycle can be folded to allow it to be carried One mark for each line drawn between the aspect and the correct intellectual property. No mark for any aspect linked to both intellectual properties. (6 x 1)	**(6)**

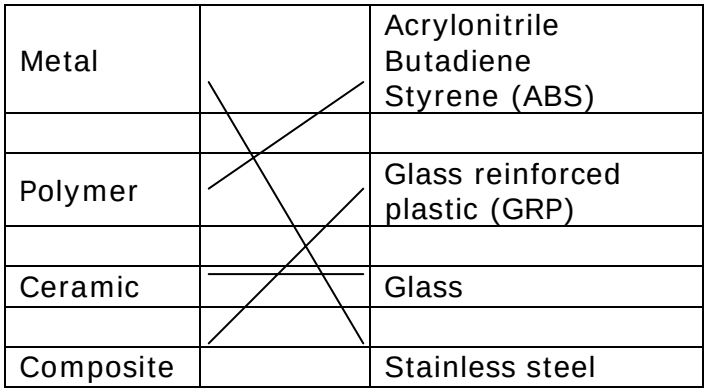
Question Number	Answer	Mark
2(a)	Accept any two of the following answers • Too expensive to build (1) • Appropriate material limitations (1) • Time consuming with such a busy airport (1) • An initial phase to trial the system (1) • Might not be a success (1) • Too much disruption at airport (1) • Too much space required for network of guideways (1) • Similar product already available on the market (1) • No perceived market (1) Accept any reasonable answer. (2 x 1) (1 x 2)	**(2)**

Question Number	Answer	Mark
2(b)	One mark for identifying, one mark for description x 2 (max 4) • Operational testing (1) – ensure that power is being generated (1) • Movement testing (1) able to move/ corner, climb and descend guideways (1) • Electrical testing (1) – ensure that control systems are functioning (1) • Durability/reliability testing (1) – continuous user trials (1) • Ergonomic testing (1) – through ride comfort (1) • Legal compliance testing (1) – to ensure it meets required standards for passenger travel (1) • Materials testing (1) – parts fit for purpose (1) • Safety testing (1) – injury prevention (1) Accept any reasonable description. (1 x 2) (1 x 2)	**(4)**

Question Number	Answer	Mark
2(c)(i)1	• Venture Capitalist Accept any recognisable spelling (phonetic) of the above answer. Do not accept only 'capitalist' as an answer. (1 x 1)	**(1)**

Question Number	Answer	Mark
2(c)(i)2	• Shareholder • Stockholder Accept any recognisable spelling (phonetic) of the above answer. (1 x 1)	**(1)**

Question Number	Answer	Mark
2(c)(ii)	One mark for identifying, one mark for description Bank – A financial institution that accepts deposits (1) and channels the money into lending activities (1). Also offers investments and savings (1). Interest charges will apply (1). Private Funding – An organisation/individual committed to raising funds for business ventures (1) such as new innovations (1) like the PodRide (2 x 2)	**(4)**

Question Number	Answer	Mark
3(a)	One mark for each correct line **Type of material** **Specific material**  No mark for any description linked to more than one type (4 x 1)	**(4)**

Question Number	Answer	Mark
3(b)	Any two of the following answers • Flexible • Malleable • Easily moulded • Lightweight • Soft when heated • Strong Accept any reasonable response (2 x 1)	**(2)**

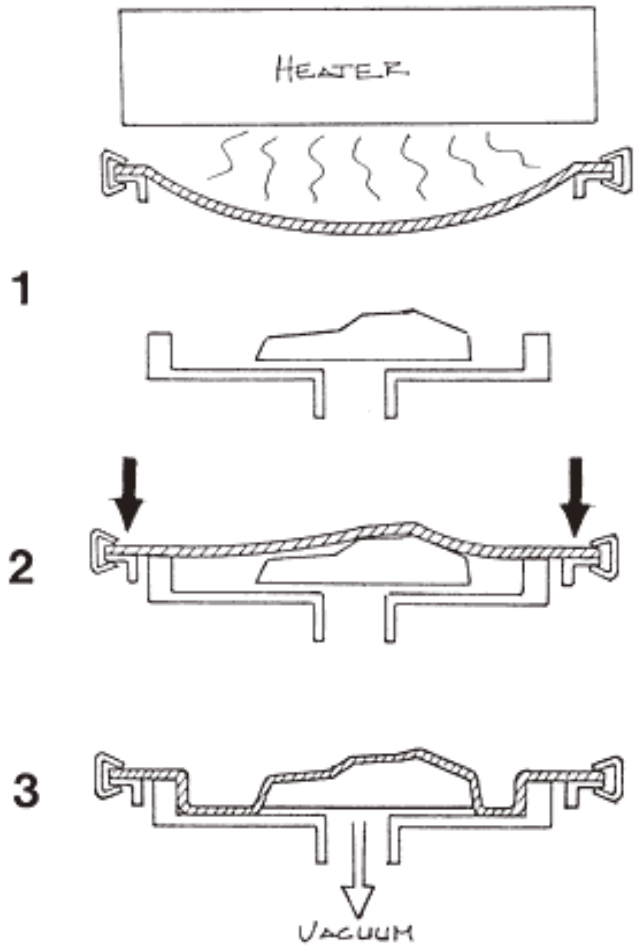
Question Number	Answer	Mark
3(c)(i)	Any of the following answers – up to 2 marks ▪ Materials that have one or more properties that can be significantly changed in a controlled fashion (1) by an external stimuli, such as stress, temperature, light, moisture, pH, electric or magnetic fields (1) ▪ Materials that sense environmental conditions/ changes (1) and responds to them (1) ▪ Materials that appear to 'think' (1) or have some memory (1) ▪ Can change their mechanical properties (1) ▪ Can change their thermal properties (1) ▪ Can change their optical properties (1) ▪ Can change their electromechanical properties (1) ▪ Interacts with the environment (1) ▪ Responds to environment such as heat or light (1) Do not accept answers that relate to standard thermoplastic characteristics eg returning to original shape when re-heated. (2 x 1) (1 x 2)	**(2)**

Question Number	Answer	Mark
3(c)(ii)	Any two of the following answers • Polymorph (1) • Shape memory alloys (1) • Smart wire (1) • Memory wire (1) • Smart springs (1) • Anodized aluminium (1) • QTC-Quantum Tunnelling Composite (1) • Nitinol (1) • Exotic Stainless Steel (1) • Piezoelectric (1) • Ionic Polymers (1) • Magneto/electro - rhological fluids (1) • Cold forming polymers (1) • Smart grease (1) Or other appropriate smart material (2 x 1)	**(2)**

Question Number	Answer	Mark
4(a)	One mark for identifying, one mark for description x 2 (max 4) • Much slower loss of charge (1) when not being used (1) • Wide variety of shapes and sizes (1) efficiently fitting the devices they power (1) • Much lighter than other batteries (1) increasing performance / cost efficiency (1) • High open circuit voltage (1) increasing amount of power produced at a lower current (1) • Components are environmentally safe (1) as there is no free lithium metal (1) • Easier to recharge (1) no maintenance required (1) Accept any appropriate answer (2 x 1) (2 x 1)	**(4)**

Question Number	Answer	Mark
4(b)	One mark for identifying, one mark for outline • Reduces emissions of greenhouse gases (1) because the only by product is heat (1) • Reduce the dependence on fossil fuels (1) much more efficient way of generating electricity (1) • Hydrogen cells manufactured from rare materials (1) which have a finite supply (1) • Reduces carbon footprint (1) that helps reduce global warming (1) Accept any reasonable answer (2 x 1)	**(2)**

Question Number	Answer	Mark
5	A description that makes reference to any of the following points or sketches • This is a thermoforming process (1) • The mould is placed on a table in the vacuum former chamber (1) • Uses flat sheet/thermoplastic material (1) • Placed over a rubber seal (1) • Securely clamped (1) • Create an air tight seal in the chamber (1) • The material is then heated to an appropriate temperature (1) • Allows material to become flexible/ plastic (1) • The mould is then lifted into the sheet material (1) • The air is removed from the chamber(1) • Sheet material stretches over the moulded shape (1) • The sheet material is allowed to cool (1) before being unclamped (1) and the mould removed from the sheet material (1)	**(8)**



Example
This is a thermoforming process (1) that uses flat thermoplastic material (1). A mould is placed on the table of the machine (1) and lowered into the chamber (1). The flat material is securely clamped (1) to create an air tight seal (1). The material is then heated until flexible (1) and the mould lifted into the sheet (1) with the air being removed (1) to allow the material to stretch over the mould (1) and create the desired shape (1). The material is allowed to cool (1) and then removed for trimming (1).

Up to a maximum of 8

(1 x 8)

Question Number		Indicative Content
6(a)		• Predictable journey times helping passengers to plan travel arrangements more precisely • No congestion as Pods use an elevated guideway. • Avoids delays and ultimately frustration on journeys • Pod privacy allows passengers to relax • Easy to use system with a novel affect to excite passengers. • Safe travelling environment due to sophisticated guidance and safety systems • Easy, convenient low cost travel • Disabled access
Level	**Mark**	**Descriptor**
	0	No rewardable material
1	**1-2**	Identification of at least two impacts or justification of at least one social impact of using this form of transport.
2	**3-4**	Brief description of at least two impacts or detailed description of one impact of using this form of transport.
3	**5-6**	Detailed description of two or more impacts of using this form of transport.

Question Number		Indicative Content
6(b)		• Smaller vehicle sizes and lightweight infrastructure compared with other forms of transport resulting in less material requirements • The versatility of the pod being able to adapt to existing surroundings, able to turn much more sharply and go up and down inclines with relative ease means that the guideways occupy reduced space • Reduced noise reductions and vibrations through smooth operating system • Environmentally friendly form of transport with no carbon emissions and energy efficient systems that use energy only when in operation
Level	**Mark**	**Descriptor**
	0	No rewardable material
1	**1-2**	Identification of at least two benefits or justification of at least one environmental impact of using this form of transport.
2	**3-4**	Brief description of at least two benefits or detailed description of one environmental impact of using this form of transport.
3	**5-6**	Detailed description of two or more environmental benefits of using this form of transport.

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Order Code DP034397 January 2013

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