

Mark Scheme

January 2009

Principal Learning

Engineering

**Introducing the Engineering World
Level 1 (EG101)**

**Exploring Engineering Innovation, Enterprise and
Technological Advancements
Level 2 (EG208)**

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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.

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Engineering

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30	A	(1)

Engineering
Exploring Engineering Innovation, Enterprise and Technological
Advancements Level 2 Unit 8

Question Number	Answer	Mark
1 (a)	<p>One mark for each correct answer only In this order</p> <ul style="list-style-type: none"> • Copyrights • Trade Marks • Designs • Patents <p>More than one type identified in each option, no Marks</p>	(4)

Question Number	Answer	Mark
1 (b)	<p>One mark for correct answer</p> <ul style="list-style-type: none"> ▪ Patent 	(1)

Question Number	Answer	Mark
1 (c)	<p>Any statement that indicates correct choice:</p> <ul style="list-style-type: none"> • New idea (1) • Novel idea (1) • Substantially new (1) • Unique product (1) • Combine/repurpose existing idea (1) • Stop ideas from being stolen (1) • Put on a register (1) • Stop idea being exploited (1) <p>Allow follow through up to two marks if answer in 1(b) is incorrect but is one of the four intellectual properties and is given correctly.</p> <p>If answer given is copied from 1(a) 1 mark only</p> <p>If no answer given in 1(b) no mark in 1(c).</p>	(2)

Question Number	Answer	Mark
1 (d)	<p>One mark for identifying any benefits</p> <p>Up to two marks for explaining</p> <ul style="list-style-type: none"> • Stop the idea from being stolen (1) – legally protected (1) – on a National database (1) • Stop the idea from being copied (1) – legally protected (1) – on a National database (1) • Stop the idea from being commercially exploited - legally protected (1) – on a National database (1) • Earn royalties (1) – franchise or license (1) – protected market (1) <p>If answer given is copied from 1(a) 1 mark only</p> <p>Any combination of the answers above as long as they are appropriately linked.</p>	(3)

Question Number	Answer	Mark
2 (a)	<p>One mark for each different market research question</p> <ul style="list-style-type: none"> • What other products are available? (1) • Are there any similar products available (1) • What is the cost of similar types of product? (1) • Are similar products successful? (1) • Is there a large enough market for Mass production (1) • What materials are similar products made from? (1) • What manufacturing techniques have similar products used? (1) • What will customers pay for the product? (1) • How far can the product be distributed profitably? (1) • Where will the torch be sold (1) • Carry out trial test with a group of customer? (1) • Complete a customer questionnaire (1) <p>Accept any other reasonable market research step</p>	(3)

Question Number	Answer	Mark
2 (b)	<p>One mark for identifying the activity Up to two marks for explaining how</p> <ul style="list-style-type: none"> • Prototyping (1) – produce a working model (1) – test for operation (1) • Testing in hot and cold conditions (1) – Place in oven at fixed temperature (1) – place in freezer at fixed temperature (1) • Pressure and watertight tests (1) – submerge the torch in water (1) – pressurise water in a sealed tank (1) • Reliability and durability tests (1) – use the torch for a fixed number of cycles (1) – check torch in rough use conditions (1) • Drop and soak tests (1) – subject torch to shock (1) – turn on torch and run till flat (1) • Usability test (1) – ergonomic feel of torch (1) – usability of switch and wind mechanism (small fingers, large fingers, gloves etc) (1) • Mock up test (1) – usability (1) – limits (1) – destructive (1) • Check for sharp edges and production defects (1) – visual examination (1) – check for snags (1) <p>Up to three marks can be given for a full explanation Two or more low responses – maximum two marks</p>	(3)

Question Number	Answer	Mark
2 (c)	<p>One mark for each correct answer</p> <ul style="list-style-type: none"> • Banks (1) • Building societies (1) • Grants (1) • Private finance (1) • Own money (1) • Venture capitalists (1) • Friend and family (1) • Stakeholders (1) • Shares in the company (1) • Fund raiser (1) • Sponsorship (1) • Work for money (1) • Loan (1) • Princes Trust (1) • Charity event (1) • National lottery (1) • Approach Entrepreneur (1) <p>Accept any reasonable answer No marks for Dragons Den – unless they clarify Venture capitalists</p>	(4)

Question Number	Answer	Mark
3 (a)(i)	<ul style="list-style-type: none"> • PVC (1) • PET (1) • PP (1) • PC (1) • ABS (1) • HDPE (1) • Brass (1) • Copper (1) • Aluminium /Aluminium alloy (1) <p>Accept any reasonable material Do not accept 'metal', 'plastic', plastics', 'polymer' or 'alloy'</p>	(1)

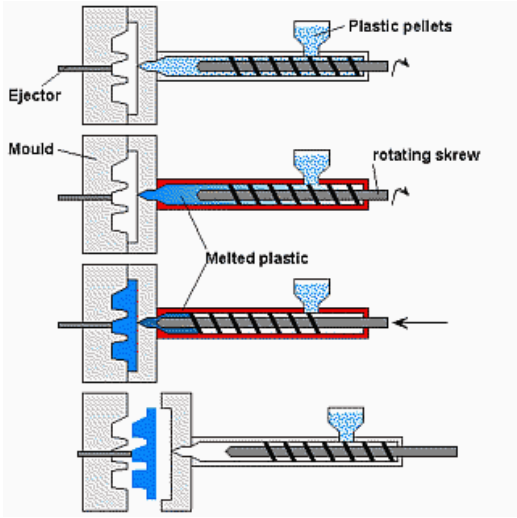
Question Number	Answer	Mark
3 (a)(ii)	<ul style="list-style-type: none"> • Waterproof (1) • Corrosion resistant (1) • Tough (1) • Light (1) • Cheap and easy to mould into shape (1) • Recyclable (1) • Strong (1) <p>Allow follow through if the response is appropriate to the material given in 3(a)(i), and is suitable for the casing.</p>	(1)

Question Number	Answer	Mark
3 (b)(i)	<ul style="list-style-type: none"> • Brass (1) • Copper (1) • Gold (1) • Silver (1) <p>Accept any reasonable material with conductive properties.</p>	(1)

Question Number	Answer	Mark
3 (b)(ii)	<ul style="list-style-type: none"> • Good electrical conductor (1) • Corrosion resistance (1) • Sustainable (1) • Recyclable (1) <p>Allow follow through if the response is appropriate to the material given in 3(b)(i) and is suitable for the switch contact.</p>	(1)

Question Number	Answer	Mark
3 (c)(i)	<ul style="list-style-type: none"> • Aluminium bulb reflector (1) • Coated plastic (1) • Glass (1) • Stainless Steel (1) • Chrome plated steel (1) <p>Accept any reasonable material with reflective properties or any suitable material that has been coated, plated or appropriately finished.</p>	(1)

Question Number	Answer	Mark
3 (c)(ii)	<ul style="list-style-type: none"> • Light (1) • Ductile (1) • Easy to spin or stamp into shape (1) • Can be polished to reflect light (1) • Sustainable (1) • Recyclable (1) • Reflective (1) • Shiny (1) <p>Allow follow through if the response is appropriate to the material given in 3(c)(i) and is suitable for the reflector.</p>	(1)

Question Number	Answer	Mark
4	<p>One mark for identifying the process Three marks for description of the process and sketching</p> <ul style="list-style-type: none"> • Torch casing – die casting (1) • Torch casing – injection moulded (1) • Torch casing – extrusion (1) • Torch casing – vacuum foaming (1) <p>Put pellets into a hopper, warmed and liquefied as pushed into a split mould down Archimedes screw, mould cooled and opened to reveal casting (2)</p> <p>The process of forming a material by forcing it from a heated cylinder, under pressure, through a spur into a cavity of a confined mould. (2)</p> <p>A moulding procedure whereby a heat-softened plastic material is forced from a cylinder into a relatively cool cavity which gives the article the desired shape. (2)</p> <p>Sketches (2) Annotated sketches (3)</p> <p>Accept any reasonable explanation.</p> <p>Up to 2 marks for notes or sketches, to gain all 3 marks both notes and sketches must be included.</p> 	(4)

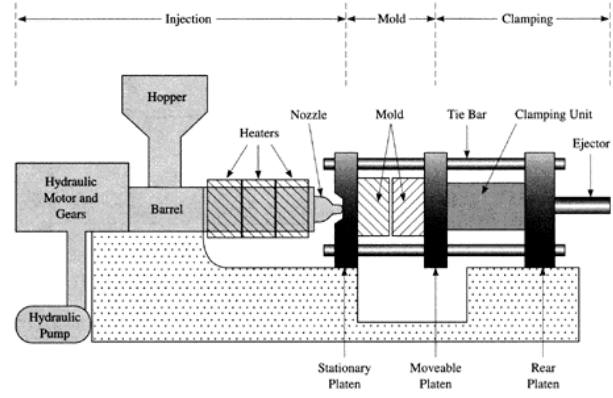
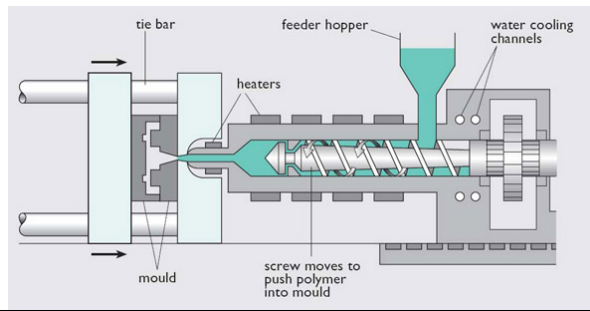
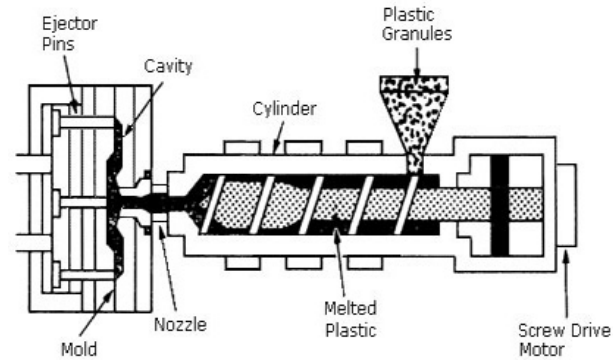
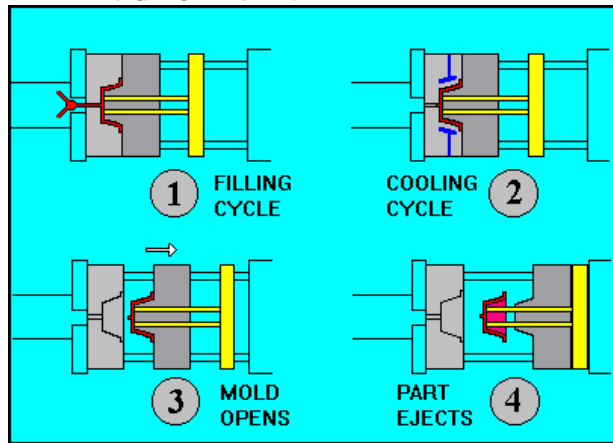


Figure 1 Injection molding machine showing three major functional units (injection, mold, and clamping) along with major components of each unit.



Question Number	Answer	Mark
5 (a)	<p>One mark for each correct answer</p> <ul style="list-style-type: none"> • Batteries don't run out /Continuous power supply (1) • No batteries required (1) • No batteries to purchase (1) • No batteries to dispose of (1) • No external batteries to charge (1) • Ready for use anytime (1) • Can work in wet or damp conditions/ waterproof (1) • Always works when you need it (1) • No cost associated with use (1) • Cheap running costs for jobs like electric or gas meter readers (1) • Reliable (1) • No special waste to dispose of (used batteries) (1) <p>Flexibility</p> <ul style="list-style-type: none"> • Suitable for working in remote areas (1) • Rechargeable on demand (1) <p>Accept any reasonable answer</p>	(6)

Question Number	Answer	Mark
5 (b)	<p>One mark for impact One mark for explanation</p> <ul style="list-style-type: none"> • Less disposal of old batteries (1) – no batteries needed (1) • No need to get rid of batteries (1) – no toxic waste which needs specialist disposal (1) • More efficient use of materials (1) - reduction in the extraction of raw materials (1) • No need to recharge batteries (1) – less use of electricity, less energy consumption (1) • Less pollution (1) – there is less waste (1) – if lost under water or buried (1) • Less waste (1) – materials used can be recycled (1) <p>Accept any combination</p> <p>2 x 2 part answers required to receive all 4 marks</p>	(4)

Question Number	Answer	Mark
6 (a)	<p>Two marks for impact Two marks for reduction</p> <ul style="list-style-type: none"> • (i) Impact: Raw materials often carry a heavy carbon footprint (1) due to their geographical position in the world (1). • (i) Impact: Raw materials often carry a heavy carbon footprint (1) due to their production/mining techniques (1). • (i) Impact: Raw materials often carry a heavy carbon footprint (1) due to their method of transport (1). • (ii) Reduction: Source raw materials (1) from a closer geographical position (1) – or carbon offset (1) • (ii) Reduction: Choose materials that come from efficient (1) and sustainable (1) production processes, or carbon offset (1) • (ii) Reduction: Choose locally (1) recycled materials (1) for the product or cleaner energy (1) or more efficient transport method (1) or carbon offset (1) <p>Any reasonable answer One or more low response for either impact or reduction only one mark</p>	(4)

Question Number	Answer	Mark
6 (b)	<p>Two marks for impact Two marks for reduction</p> <ul style="list-style-type: none"> • (i) Impact: Many industrial manufacturing process use vast quantities of energy (gas, oil, coal (1)) and therefore the production process often has a heavy carbon footprint. (1) • (ii) Reduction: Use green production process (1) that themselves use sustainable energy (1) and are efficient. (1), or carbon offset (1). <p>One or more low response for either impact or reduction only one mark</p>	(4)

Question Number	Answer	Mark
6 (c)	<p>Two marks for impact Two marks for reduction</p> <ul style="list-style-type: none"> • (i) Impact: Poor production techniques (1) can produce waste product. (1) • (i) Impact: Waste may go into landfill sites (1) further releasing green house gases (1) • (ii) Reduction: Design the product to fit closely with existing forms or supply of raw material (1) (sheet steel, box section, etc) to reduce waste in the production process. (1) • (ii) Reduction: Recycle waste (1) to reduce waste disposal. (1) • (ii) Reduction: Control process (1) to reduce waste (1) <p>One or more low response for either impact or reduction only one mark</p>	(4)

Question Number	Answer	Mark
6 (d)	<p>Two marks for impact Two marks for reduction</p> <ul style="list-style-type: none"> • (i) Impact: Packaging can take longer to produce than the product itself (e.g. food) (1), therefore uses more energy (1) • (i) Impact: Packaging adds to transportation (1), producing more pollution (1) • (i) Impact: Packing is often non-biodegradable (1) therefore ends up in landfill (1) • (i) Impact: Documentation often discarded (1) and ends up in landfill (1) • (ii) Reduction: Reduce packaging to a minimum. (1), to reduce landfill needs (1) • (ii) Reduction: Use recycled card or paper for packaging, (1), to reduce landfill needs (1) • (ii) Reduction: Use virtual, online or electronic instruction books. (1), to reduce material use/transport use (1) • (ii) Reduction: Design intuitive products (1) that need little or no instructions (e.g. iPod) (1) <p>One or more low response for either impact or reduction only one mark</p>	(4)

Question Number	Answer	Mark
6 (e)	<p>Two marks for impact Two marks for reduction</p> <ul style="list-style-type: none"> • (i) Impact: Extra transport uses fossil fuels (1) that damages the environment (1) • (i) Impact: Transport produces pollution (1) and increases global warming (1) • (i) Impact: Distribution centre built on greenfield sites (1) attract more transport causing pollution (1) • (ii) Reduction: Consider small production centres/plants (1) closer to customers. (1) • (ii) Reduction: Minimise movement of goods (1), explore other forms of transport i.e. waterways (1) <p>One or more low response for either impact or reduction only one mark</p>	(4)

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