

Mark Scheme (Results)

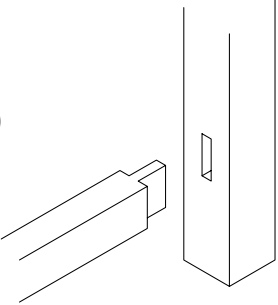
Summer 2008

GCE

GCE Design and Technology (6142) Paper 1

Unit 6142/01 Knowledge and Understanding of Product Design

Question Number	Answer	Mark
1_(a)	<p>Metal step ladder</p> <p>Material - Aluminium / duralumin (1) Property - Light / Strong / Resistant to corrosion (1) Material - Steel (1) Property - Strong / Economic (1) Material - stainless steel (1) Property - Strong / corrosion resistant / aesthetics (1)</p> <p>Plastic lettering on a shop sign</p> <p>Material - Acrylic (1) Property - Aesthetics (good looks, shiny, bright) / range of colours / durable / UV resistant / easy to cut using CAD/CAM or other specified appropriate method / translucent to let light through (1) Material - Vinyl (PVC) (1) Property - Aesthetics (good looks, shiny, bright) / range of colours / durable / UV resistant / easy to cut using CAD/CAM or other specified appropriate method / Flexible / translucent to let light through / can be easily printed on (1)</p> <p>NB. If material is unsuitable do not award the property e.g. brass - property: strength = no marks</p> <p style="text-align: right;">(4x1)</p>	4
(b)	<p>Any two of the following:-</p> <ul style="list-style-type: none"> • Softwoods come from Coniferous (evergreen) trees / hardwoods come from deciduous trees (1) • Growth time - Softwoods generally grow quicker (30yrs) / hardwoods generally grow slower (100+ yrs) (1) • Softwoods generally open grain / hardwoods generally closed grain (1) • Hardwood is generally more durable, rot resistant / softwood is generally less durable, rot resistant (1) • Hardwoods are generally stronger / softwoods are generally weaker (1) • Hardwoods are generally more expensive / softwoods are generally cheaper (1) • Hardwood generally have fewer knots / softwoods have more (1) • Their cell structure is different (1) • Hardwoods are heavier / denser than softwoods (1) <p><i>Do not accept colour / leaf / fruit differences.</i></p> <p>1 mark per difference - max 2</p> <p style="text-align: right;">(2x1)</p>	2

Question Number	Answer	Mark
(c)	<p>A sketch that make reference to the following three points:</p> <ul style="list-style-type: none"> • Mortise (1) • Tenon (1) • Good proportion of tenon to mortise (1)  <p style="text-align: center;">Mortise and Tenon</p> <p>N.B if only a single 2D drawing is presented, award a maximum mark of 2 marks only.</p> <p style="text-align: right;">(3x1)</p>	3
	Total for question	9

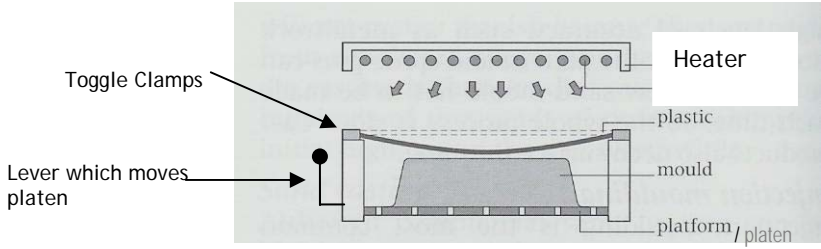
Question Number	Answer	Mark
2_(a)	<p>1 mark per hazard and 1 mark per appropriate control measure</p> <p>Pillar drill</p> <ul style="list-style-type: none"> • Flying debris (1) - operator must wear goggles (1) • Hot, sharp swarf (1) - operator must wear gloves (1) • Contact with moving parts (1) - guards must be in place / tie back loose hair / clothing / remove jewellery (1) • Contact with moving work piece (1) - clamp work piece (1) • Misuse (1) - operator must have had appropriate training (1) • Chuck key left in (1) - correct training to remove key (1) • Un-serviced equipment / unsafe equipment / broken equipment (1) - regularly maintain equipment (1) • Distractions (1) - define work area box for one person (1) • Both hands in use during machining (1) - hip or foot stop (1) • Under going maintenance - (1) - safe practice established e.g. isolate before commencing (1) <p>Welding equipment</p> <ul style="list-style-type: none"> • Arc eye / intense light (1) - operator must use darkened face mask / goggles (1) • Personnel in vicinity exposed to welding flash / flame (1) - area screened off (1) • Burns (1) - gloves, wear personal protective equipment (PPE) (1) • Breathing fumes (1) - adequate ventilation (1) • Risk of fire (1) - extinguisher in vicinity (1) • Misuse (1) - operator must have had appropriate training (1) • Un-serviced equipment / unsafe equipment / broken equipment (1) - regularly maintain equipment (1) • Under going maintenance - (1) - safe practice established e.g. isolate before commencing (1) 	

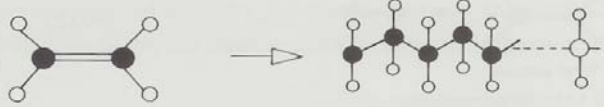
Question Number	Answer	Mark
2_(a) con't	<p>Disc / Belt sander</p> <ul style="list-style-type: none"> <li>• Flying debris (1) - operator must wear goggles (1) <li>• Contact with moving parts (1) - guards must be in place / tie back loose hair / clothing / remove jewellery (1) <li>• In running nips (1) - minimum gap maintained (1) <li>• Distractions (1) - define work area box for one person (1) <li>• Both hands in use during machining (1) - hip or foot stop (1) <li>• Inhalation of dust (1) - face mask / functioning extractor (1) <li>• Misuse (1) - operator must have had appropriate training (1) <li>• Un-serviced equipment / unsafe equipment / broken equipment (1) - regularly maintain equipment (1) <li>• Under going maintenance - (1) - safe practice established e.g. isolate before commencing (1) <p style="text-align: right;">(4x1)</p>	4

Question Number	Answer	Mark
(b)	<p>1 mark for each</p> <p>Employers must ensure a safe working environment / minimize the risk of accidents for their employees i.e. equipment, training, work methods etc (1)</p> <p>Employees must ensure they follow all regulations set i.e. wear safety equipment / follow safe practices (1)</p> <p style="text-align: right;">(2x1)</p>	2
(c)	<p>Any two of the following:-</p> <ul style="list-style-type: none"> • To protect people's health and safety by controlling risks in the work environment (1) • Develop and revise regulations in response to change (1) • Provide training and advice (1) • Enforce compliance / carry out spot checks (1) • Respond to complaints / investigate accidents / breaches (1) <p style="text-align: right;">(2x1)</p>	2
	Total for question	8

Question Number	Answer	Mark
3_(a)	<p>Any one of the following :-</p> <ul style="list-style-type: none"> • Contains ferrite / Contains iron (1) • Will corrode / Oxidise / Rust (1) • Is Magnetic (1) <p style="text-align: right;">(1x1)</p>	1
(b)	<ul style="list-style-type: none"> • Batch production (1) <p><i>Only acceptable answer</i></p> <p style="text-align: right;">(1x1)</p>	1
(c)	<ul style="list-style-type: none"> • European safety mark / European safety standard (1) <p><i>Only acceptable answer</i></p> <p style="text-align: right;">(1x1)</p>	1
(d)	<p>1 mark for process and 1 mark for named part of the lathe used.</p> <ul style="list-style-type: none"> • Stage 2: Centre drill (1) drill holes (1) using the tail stock / fixed drill piece (1) • Stage 3: Taper turn (1) using the compound slide (1) when set at an angle (1) • Draw profile on CAD (1) CNC produces taper using two axes of movement (1) <p style="text-align: right;">(2x1) (2x1)</p>	4
(e)	<p>Any four of the following:-</p> <ul style="list-style-type: none"> • Faster production of parts (1) • More accurate machining / quality of finish (1) • Repetitive accuracy - less reject parts / reduced human error (1) • Able to produce complex components (1) • Reduced labour costs (1) • 24/7 production i.e. don't need breaks / shift change means increased productivity (1) • Flexible i.e. easily reprogrammed for more or alternate batches (1) • Improved worker safety as machine enclosed (1) <p style="text-align: right;">(4 x1)</p>	4
Total for question		11

Question Number	Answer	Mark
4_(a)	<p>1 mark per labelled feature on diagram and / or each written point. Max 3 if no diagram or no notes.</p> <div> </div> <ul style="list-style-type: none"> • Description or diagram of two part rivet (1) • Rivet loaded in rivet gun / diagram of gun (1) • Handles squeezed / lazy tongs pushed / pin pulled / arrows on diagram (1) • Rivet splays / diagram shows splayed rivet (1) • Pin snaps off / diagram of snapped pin (1) <p style="text-align: right;">(4x1)</p>	4
(b)i	<p>Any two of the following:-</p> <ul style="list-style-type: none"> • It is a computer generated / on screen image (1) • 3 dimensional image / rotatable image (1) • Image generated from mathematical data (1) <p style="text-align: right;">(2x1)</p>	2
(b)ii	<p>Any four of the following:-</p> <ul style="list-style-type: none"> • Designs can be visualised in 3D earlier in the design process (1) • Working drawings can be quickly generated from the virtual model (1) • Can be virtually tested / animated to check that it fits / works / functions as expected without a physical model (1) • Can be used to generate a machining programme (1) • Can be rendered to produce a photorealistic image for advertising / packaging / promotional purposes (1) • Experiment / edit rapidly with different colour schemes / styles (1) • Electronically sent to clients / consultants for immediate feedback (1) • Virtual model is produced to precise / accurate sizes (1) <p style="text-align: right;">(4x1)</p>	4
Total for question		10

Question Number	Answer	Mark
5_(a)	Any one of the following:- <ul style="list-style-type: none"> • Chromium (1) • Nickel (1) • Magnesium (1) <p style="text-align: right;">(1x1)</p>	1
(b)	Any one of the following:- <ul style="list-style-type: none"> • Corrosion resistant (1) • Improved aesthetics - shiny (1) • Reduced magnetic properties (1) <p style="text-align: right;">(1x1)</p>	1
(c)	Any two of the following:- <ul style="list-style-type: none"> • The metals to be alloyed are heated in a furnace (1) • The metals melt into a molten / liquid state (1) • The melted metals are mixed / combined (1) <p style="text-align: right;">(1x1) (1x1)</p>	2
(d)	Any four of the following features of the diagram:- <div style="text-align: center; margin: 10px 0;">  </div> <p style="text-align: right;">(4x1)</p>	4

Question Number	Answer	Mark
5_(e)	<p>1 mark per diagram and explanatory point.</p> <div style="border: 1px solid black; padding: 5px;"> <p>Diagrammatic form</p> <p>Key ● carbon ○ hydrogen</p>  </div> <ul style="list-style-type: none"> • Diagram of individual monomer(s) / reference to monomer (1) • Double bond is split / double bond in diagram (1) • Chain reaction occurs (1) • Long chains are formed / diagram of long chain (1) • Catalyst / Heat / pressure is needed for the process to take place (1) • The long chains can be between 200 and 2000 links (1) • Cross links / covalent bonds are formed / diagram shows a clear cross links (1) <p style="text-align: right;">(4x1)</p>	4
	Total for question	12

Question Number	Answer	Mark
6_(a)	<p>Any two of the following points with its explanation :-</p> <ul style="list-style-type: none"> • Can easily modify production planning in light of new data (1) so production is optimised based on latest information (1) • Plan for the effective use of machine time (1) maximizing manufacturing potential and minimizing non productive time (1) • Electronic systems allow immediate implementation of the production plan (1) reducing delays between changing operations (1) • Facilitate efficient production (1) reducing delays / downtime / maintaining stock levels (1) and automatically reordering stock (1) • Can quickly calculate costings / timings (1) giving precise / reliable information (1) • Less paper copies of schedules need to be printed (1) reducing costs (1) <p style="text-align: right;">(2x1) (2x1)</p>	4
(b)	<p>Any three of the following strategies with its description.</p> <ul style="list-style-type: none"> • Finite capacity scheduling (1) - (Resourced based) Manufacturing capability analysed in order to predict the completion time (1) • Infinite capacity scheduling (1) - (Time based) Completion date set and capacity manipulated to meet this deadline (1) • Order based scheduling (1) - Tasks are scheduled based on order priority (1) • Constraint based scheduling (1) - Identifies potential bottlenecks and sequences events to eliminate them (1) • Discrete event scheduling (1) - Analyses production stages identifying gaps, then seeks to reduce / eliminate them, resulting in more stable production lines (1) <p style="text-align: right;">(3x1) (3x1)</p>	6
Total for question		10

Question Number	Answer	Mark
7_(a)	<ul style="list-style-type: none"> • A material that reacts / changes (1) to a given input / environment change (1) <p>NB: If properties of a specific smart material are described, one mark only</p> <p style="text-align: right;">(2x1)</p>	2
(b)	<p>Any six of the following:-</p> <ul style="list-style-type: none"> • Use more recycled material for production (1) • Use materials than can be easily recycled at the end of the products life (1) • Design it for easy disassembly to aid recycling (1) • Reduce the range of materials in the product to maximize its recycling potential (1) • Reduce the usage of combined materials which cannot be separated and recycled (1) • Design product to be easily repairable / reusable rather than disposable, so extending its life (1) • Reduce the amount of energy the product needs when in use (1) • Reduce the volume of material used in manufacture by re-design (1) • Reduce waste by using more bio-degradable materials in products (1) • Designer could use a material which requires less energy to extract / process / less harmful to dispose of (1) • Select cleaner manufacturing processes which use less energy / produce less harmful waste (1) • Base manufacturing nearer source materials / market to reduce transport costs (1) • Use materials from sustainable sources (1) <p style="text-align: right;">(6x1)</p>	6
	Total for question	8

Question Number	Answer	Mark
8_(a)	<p>Any four of the following:-</p> <ul style="list-style-type: none"> <li>• Smaller products are often more desirable due to increased portability / reduced size / reduced weight / less space (1) <li>• Smaller products can be seen as being more advanced therefore are more appealing / fashionable to some consumers (1) <li>• More features can be included into a product making it more appealing (1) e.g. longer battery life <li>• Designer has more scope to develop style of product as electronic systems are so small they have little impact on the shape of the end product (1) <li>• Products can be made and sold cheaper due to less material / transport / storage / packaging costs (1) <li>• Reduce stigma from visible medical aids as they are more inconspicuous (1) <p style="text-align: right;">(4x1)</p>	4

Question Number	Answer	Mark
8_(b)	<p>Any eight of the following:- Max seven if only advantages or disadvantages given.</p> <ul style="list-style-type: none"> • A - Consumers presented with an ever increasing volume of readily available products (1) • A - Consumers can buy cheaper goods due to increased competitiveness (1) • A - Consumers have a higher standard of living (1) • A&D - Consumers have a continuing expectation / thirst for more advanced / higher quality goods (1) • D - Due to increased range of similar products consumers find it more difficult to choose (1) • D - Consumers value goods less due to cheapness and ready availability (1) • D - Consumers encouraged to upgrade when styles changes rather than a when product reaches the end of its life (1) • D - Consumers forced into replacing / upgrading products due to design for obsolescence (1) • D - Consumers encouraged to dispose of faulty goods rather than repair (1) • D - Materialistic view of society encouraged (1) • D - Encourage over - spending resulting in debt (1) • D - Encouraged to buy products not really needed resulting in more waste (1) • D - People having to live in polluted environments (1) • A&D - Growing concern among consumers of environmental issues due to waste / pollution (1) <p style="text-align: right;">(8x1)</p>	8
Total mark for question		12
Total marks for paper		80