OCR
Oxford Cambridge and RSA

GCE

Design and Technology

Unit **F524/01:** Product Design: Component 1

Advanced GCE

Mark Scheme for June 2014

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning of annotation
BP	Blank Page – this annotation **must** be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.

MARK SCHEME: Construction and the built environment

Question			Answer	Mark	Guidance
1	(a)		Justified design requirements for the flat roof structure: • Strength of the roof – supports the dead loads of the roof members and coverings together with any imposed loads such as snow and wind without deflection. Flat roofs rely on support from the walls and the depth of the joists. • Stability of the roof – retaining straps, shoes etc. fixed to the supporting walls. • Resistance to weather – to exclude rain and snow etc. as regular penetration will cause degradation of the internal fabric, ceilings, roof structure etc. • Durability of the roof – depends largely on the ability of the roof's covering to exclude rain because regular penetration will cause the roof structure to decay or corrode. Most flat roof coverings have a limited lifespan. • Fire safety – Approved Document B fire resistance is required to limit the spread of flame across the surface of the roof covering to adjacent buildings and the means of escape to a place of safety. • Resistance to the passage of heat – the roof structure's materials and coverings are poor insulators against the transfer of heat. To comply with Approved Document L some form of insulation will be required. • Resistance to the passage of sound – not usually a consideration but may be a problem with airborne sound if close to an airport or busy road. • Air leakage – efficient ventilation is required to prevent condensation in the roof space that can cause timber to rot or metal to corrode.		Clear statement and justification required for a mark Must be related to the product – no marks for generic responses Must be a full response – - no marks for identification only. **Four** justified design requirements. Give one mark if two valid points given but not fully justified.

Question			Answer	Mark	Guidance
			• Aesthetics – appearance will largely be influenced by the context and locality of the building. • The ability to shed rainwater with appropriate drainage.	4	
	(b)		Benefits of computerised stock control could be: • Lower costs to operate (could result in lower cost to consumer). • Improved efficiency. • Caters for fluctuating levels of demand. • Very quick system. • Data can be itemised for presentations to different audiences. • Data can be quickly printed or digitally shared/stored.	4	Brief description 1 mark Detailed description 2 mark **Two** benefits clearly described
	(c)		Key features could be: • Prevention of harm caused by chemicals or hazardous substances by: - Breathing in gases, dust, fumes or mist. - Swallowing. - Contact with the skin. - Contact with the eyes. - Skin puncture. • Undertake risk assessments, put in place control measures and monitor exposure of workers to hazardous substances. • Ensure correct handling of hazardous substances. • Ensure correct handling of hazardous substances. • Ensures appropriate training and use of PPE.	4	Brief description 1 mark Detailed description 2 mark **Two** features clearly described

Question	Answer	Mark	Guidance
(d)	Descriptions **Solar photovoltaic** Photovoltaic cells convert light to electricity, using large panels placed in full sunlight on roofs, fields etc. Often use inverters to raise output voltage. Benefit Low cost after initial outlay, no pollutants or waste, used in small or large scale in remote areas. **Hydro-electric** Dam is used to trap water, water released when electricity is required - turns turbines, turbines turn generators, electricity distributed. Benefit Once dam built, very low cost, no air pollution, reliable, up to full power very quickly. **Tidal Barrage** Barrage built across river estuary, turbines turn as tide enters (and when tide leaves), or relies on height difference between high/low tide, turbines turn generators, electricity distributed. Benefit Low cost after initial outlay, No pollutants or waste, Predictable.	**4**	**Level 1 (0-2 marks)** limited description 0 – 1 benefit outlined 0 - 1 **Level 2 (3 - 4 marks)** Explanation Key points included (may include sketch) up to 2 marks Benefit outlined 1 mark Benefit explained 2 marks

Question			Answer	Mark	Guidance
	(e)	(i)	**Material could be:** • Softwood eg. Redwood, Whitewood or Fir. **Properties or characteristics** • Durable. • Can be easily cut and fixed. • Economic in use. • Strength. • Usually sourced from a sustainable forest. **Material could be:** • Light gauge galvanised cold-rolled steel. **Properties or characteristics** • Durable. • Strength. • Resistance to corrosion. • Resistance to insect attack. • Resistance to fire. • Less prone to defects eg. knots, shakes, bowing, warping etc.	**3**	Award mark for other appropriate material not listed 1x1 mark Award mark for other appropriate property/characteristic 2x1 mark
		(ii)	How fall can be provided to take rainwater off a flat roof. • Roof joists are laid to a slope either by: - the joists slope end for end - the joists are horizontal but each is set at a different level to the adjacent joists. • Roof joists are laid horizontally and additional taper cut		**Level 3 (5-6 marks)** Process fully described, key features and technical details identified, **Level 2 (3-4 marks)** Key stages presented, reasonably well described with key features identified

Question			Answer	Mark	Guidance
			members are placed: - On top of them to produce a slope ie. firring pieces. - Across them to produce a slope ie. declivity pieces. • The upper edge of the roof joists are cut to a slope. • The structure is built horizontally but the insulation applied to the bearing surface varies in thickness to provide the fall.	**9**	**Level 1 (0-2 marks)** Some stages outlined (up to 2), very limited description **Quality of description and communication** Basic sketch or chart with limited annotation **1** mark Good sketch/chart with main features identified and labelled **2** marks Detailed sketch/chart with clear annotation **3** marks Max 1 if no sketch/chart used Award credit where possible if response doesn't link to chosen material.
	(f)		Issues could be: • Rapidly changing fashion in social communication. • Availability of creative advertising, video clips, animations. • Greater target marketing (radio, Internet, TV). • Wider market coverage, on the go devices. Examples • Radio – some stations (Talk Sport) target male audience. • Vast increase in Internet advertising. • Target market info gained from Facebook/Twitter/Google and other social sites.	**8**	**Level 3 (6-8 marks)** Clear, cogent and well-structured response with two or three issues well explained. Good use of examples and additional evidence to support discussion. Good use of technical vocabulary **Level 2 (3-5 marks)** One or two issues described with some explanation. Appropriate use of technical vocabulary demonstrating a good understanding of concept. Introduction of one example or supporting evidence **Level 1 (0-2 marks)** Some issues outlined, bullet points (usually focussed on one issue) no further or very limited explanation, limited use of examples or supporting evidence
					Q1 Total Mark 36

MARK SCHEME: Engineering

Question			Answer	Mark	Guidance
2	(a)		• Height of bench must suit a wide range of users • The bench should have some form of back support • Should be made as vandal-proof as possible • Be resistant to wet weather to prevent corrosion. • Should have no dangerous edges to injure users • Simple/inexpensive construction to keep costs down • Able to be fixed securely in position to prevent theft/damage • Be reasonably comfortable to sit on • Must be strong enough to support the number of people it can seat • Should fit in well with its surroundings	4	Clear statement and justification required for a mark Must be related to product – no marks for generic responses Must be a full response - no marks for identification only. **Four** justified design requirements. Give one mark if two valid points given but not justified.
	(b)		Benefits of computerised stock control could be: • Lower costs to operate (could result in lower cost to consumer) • Improved efficiency • Caters for fluctuating levels of demand • Very quick system • Data can be itemised for presentations to different audiences • Data can be quickly printed or digitally shared/stored.	4	brief description 1 mark detailed description 2 marks **Two** benefits clearly described
	(c)		Key features could be: • Prevention of harm caused by chemicals or hazardous substances (dust, fumes etc) • Monitors exposure of workers to hazardous substances		brief description 1 mark detailed description 2 marks **Two** features clearly described

Question			Answer	Mark	Guidance
			• Ensures correct handling and storage of hazardous substances • Ensures appropriate training and use of PPE	4	
	(d)		Descriptions **Solar photovoltaic** Photovoltaic cells convert light to electricity, using large panels placed in full sunlight on roofs, fields etc. Often use inverters to raise output voltage. Benefit Low cost after initial outlay, no pollutants or waste, used in small or large scale in remote areas. **Hydro-electric** Dam is used to trap water, water released when electricity is required - turns turbines, turbines turn generators, electricity distributed. Benefit Once dam built, very low cost, no air pollution, reliable, up to full power very quickly. **Tidal Barrage** Barrage built across river estuary, turbines turn as tide enters (and when tide leaves), or relies on height difference between high/low tide, turbines turn generators, electricity distributed. Benefit Low cost after initial outlay, No pollutants or waste, Predictable.		**Level 1 (0-2 marks)** limited description 0 – 1 benefit outlined 0 - 1 **Level 2 (3 - 4 marks)** Explanation Key points included (may include sketch) up to 2 marks Benefit outlined 1 mark

Question			Answer	Mark	Guidance
				4	Benefit explained 2 marks
	(e)	**(i)**	**Metals**: Stainless steel Galvanised mild steel Brass Aluminium alloy **Properties/characteristics:** Corrosion resistance Strong metal providing a firm structure Easy to form into shape required Relatively inexpensive material Readily recyclable at end-of-life Readily takes corrosion resistant finish	**3**	Award mark for other *appropriate* metal not listed 1 x 1 mark Award mark for other appropriate property/characteristic. Must relate to the specific metal given. eg: not 'inexpensive' if Brass or Stainless Steel. 2 x 1 mark
		(ii)	• Stock section metal cropped to length • Fixing holes drilled in each end of strip.(jig or CNC) *Allow drilling after bending ends if suitable jig used* • QC use fixture/jig to check sizing & positioning of holes • Bend curved ends of strip Hydraulic bending fixture or manual jig (*specify*) (*Heat required if manually operated bending jig or metal fully annealed*) • QC use fixture to check accuracy of bend • Linish / remove any sharp edges • Final QC check before finishing • Surface finishing if required (anodising / galvanising / plastic coating)		**Level 3 (5-6 marks)** Process fully described, key features and technical details identified, Answer must include detail of specialist tooling for full marks. **Level 2 (3-4 marks)** Key stages presented, reasonably well described with key features identified **Level 1 (0-2 marks)** Some stages outlined (up to 2), very limited description **Quality of description and communication** Basic sketch or chart with limited annotation **1** mark Good sketch/chart with main features identified and labelled **2** marks

Question			Answer	Mark	Guidance
				9	Detailed sketch/chart with clear annotation **3** marks Max 1 if no sketch/chart used Award credit where possible if response doesn't link to chosen material.
	(f)		Issues could be: • Rapidly changing fashion in social communication • Availability of creative advertising, video clips, animations • Greater target marketing (radio, Internet, TV) • Wider market coverage, on the go devices examples • Radio – some stations (Talk Sport) target male audience • Vast increase in Internet advertising • Target market info gained from Facebook/Twitter/Google and other social sites.	8	**Level 3 (6-8 marks)** Clear, cogent and well-structured response with two or three issues well explained. Good use of examples and additional evidence to support discussion. Good use of technical vocabulary **Level 2 (3-5 marks)** One or two issues described with some explanation. Appropriate use of technical vocabulary demonstrating a good understanding of concept. Introduction of one example or supporting evidence **Level 1 (0-2 marks)** Some issues outlined, bullet points (usually focussed on one issue) no further or very limited explanation, limited use of examples or supporting evidence
					Q2 Total Mark 36

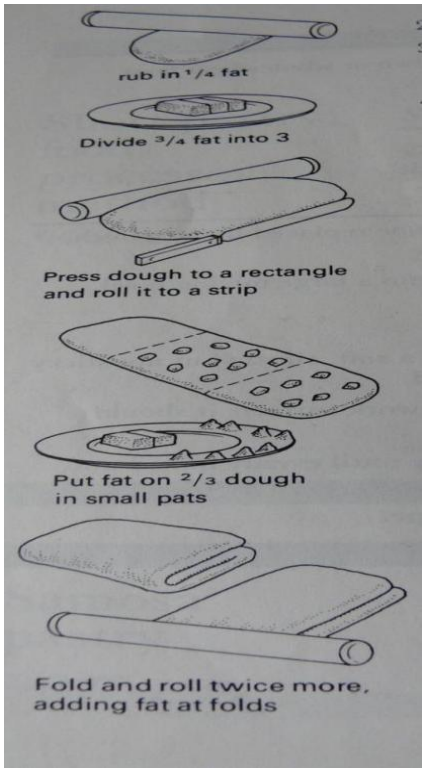
MARK SCHEME: Food

Question			Answer	Mark	Guidance
3	(a)		• The salmon meal must be suitable for freezing to be sold frozen or stored at home in the freezer. • The salmon meal must serve four people making it suitable for a family. • The salmon meal must have the edges of the pastry sealed to ensure no leakage of the sauce • The salmon meal should be pre glazed with egg wash/milk to give a golden brown finish when cooked • The salmon meal should have a trellis pattern cut out on the top so that the pastry becomes crisp and looks attractive. • .There must be sufficient sauce to moisten the product to make it easier to eat. • Pastry must cook to a golden brown flavour, cut easily with a fork, and be crisp.	4	Clear statement and justification required for a mark Must be related to the product – no marks for generic responses Must be a full response – - no marks for identification only. **Four** justified design requirements. Give one mark if two valid points given but not fully justified.
	(b)		Benefits of computerised stock control could be: • Lower costs to operate (could result in lower cost to consumer) • Improved efficiency . No wastage of ingredients • Caters for fluctuating levels of demand ie weather changes, seasons, celebrations • Very quick system • Data can be itemised for presentations to different audiences • Data can be quickly printed or digitally shared/stored.	4	brief description 1 mark detailed description 2 mark **Two** benefits clearly described
	(c)		Key features could be: • Prevention of harm caused by chemicals or		brief description 1 mark

Question			Answer	Mark	Guidance
			hazardous substances (dust, fumes etc) • Monitors exposure of workers to hazardous substances • Ensures correct handling and storage of hazardous substances • Ensures appropriate training and use of PPE	4	detailed description 2 mark **Two** features clearly described
	(d)		**Three reasons for fish in the diet:** • Good source of high biological protein • Good source of iodine • White fish is low in fat • Oily fish is a good source of essential fatty acids (those the body cannot make) Omega 3 fatty acids • Oily fish a good source of vitamins A and D • Canned fish containing bones is a good source of calcium Fish can reduce some problems associated with memory loss, cardiovascular problems, colon cancer and strokes.	4	**Level 1 (0-2 marks)** limited description 0 – 1 benefit outlined 0 - 1 **Level 2 (3 - 4 marks)** Explanation Key points included (may include sketch) up to 2 marks Benefit outlined 1 mark

Question			Answer	Mark	Guidance
					Benefit explained 2 marks
	(e)	(i)	**Details of how to manufacture flaky/rough puff pastry** **Ingredients** • 200g of **strong** plain flour (high gluten content) • 150g of fat (butter or margarine or a mixture of margarine and lard) • 150ml of cold water • 2 tsps lemon juice (to soften the gluten to make the dough stretchy) • pinch of salt (to strengthen the bonds in the flour) **Method** 1. Sift the flour into a large mixing bowl and add the salt and 30g of the butter. Mix the butter into the flour with your fingertips. 2. Stir in the water and mix the ingredients together to form a soft dough. 3. Turn out onto a floured marble surface and knead further to make a firm and pliable dough. 4. Wrap the dough in clingfilm and refrigerate for 30 minutes. 5. Soften the butter a little and shape it into a rectangle that is 1in (2.5cm) thick. 6. On a floured surface, roll out the dough to a similar rectangle shape but 3 times the length and 1in	**3**	3x1 mark

Question			Answer	Mark	Guidance
			(2.5cm) wider than the piece of butter. 7. Place the butter in the centre of the dough. 8. Fold up the bottom third and fold the top third of the pastry down over the butter so that it is completely covered. 9. Press down the edges of the dough so that they are sealed down. 10. Turn the dough a quarter turn clockwise. 11. Roll the dough out again to the original length and fold over the top and bottom as before. Seal the edges again and turn a quarter turn clockwise. 12. Repeat step 11 and then chill in the refrigerator for 30 minutes. The dough can be covered and protected with greaseproof paper. 13. Remove from the fridge and repeat the rolling, folding and turning process two more times and then chill for a final 30 minutes before either using in a recipe or freezing		

Question			Answer	Mark	Guidance
			Diagrams could include the cutting of the lattice top  		

Question			Answer	Mark	Guidance
		(ii)		9	**Level 3 (5-6 marks)** Process fully described, key features and technical details identified, Answer must include detail of specialist tooling for full marks. **Level 2 (3-4 marks)** Key stages presented, reasonably well described with key features identified **Level 1 (0-2 marks)** Some stages outlined (up to 2), very limited description **Quality of description and communication** Basic sketch or chart with limited annotation **1** mark Good sketch/chart with main features identified and labelled **2** marks Detailed sketch/chart with clear annotation **3** marks Max 1 if no sketch/chart used Award credit where possible if response doesn't link to chosen material.
	(f)		Issues could be: • Rapidly changing fashion in social communication • Availability of creative advertising, video clips, animations • Greater target marketing (radio, Internet, TV) • Wider market coverage, on the go devices		**Level 3 (6-8 marks)** Clear, cogent and well-structured response with two or three issues well explained. Good use of examples and additional evidence to support discussion. Good use of technical vocabulary **Level 2 (3-5 marks)** One or two issues described with some explanation. Appropriate use of technical vocabulary demonstrating a

Question			Answer	Mark	Guidance
			examples • Radio – some stations (Talk Sport) target male audience • Vast increase in Internet advertising • Target market info gained from Facebook/Twitter/Google and other social sites. • Massive media coverage on increasing obesity resulting in new products	8	good understanding of concept. Introduction of one example or supporting evidence **Level 1 (0-2 marks)** Some issues outlined, bullet points (usually focussed on one issue) no further or very limited explanation, limited use of examples or supporting evidence
					Q3 Total Mark 36

MARK SCHEME: Graphic Products

Question			Answer	Mark	Guidance
4	(a)		• The stand must be stable as it is freestanding. • It must be flat packed • Easy to assemble in a busy shopping area. • Must have an area to promote items. • Easy for customers to access goods.	4	Clear statement and justification required for a mark Must be related to the product – no marks for generic responses Must be a full response – - no marks for identification only. **Four** justified design requirements. Give one mark if two valid points given but not fully justified.
	(b)		Benefits of computerised stock control could be: • Lower costs to operate (could result in lower cost to consumer) • Improved efficiency • Caters for fluctuating levels of demand • Very quick system • Data can be itemised for presentations to different audiences • Data can be quickly printed or digitally shared/stored.	4	brief description 1 mark detailed description 2 mark **Two** benefits clearly described
	(c)		Key features could be: • Prevention of harm caused by chemicals or hazardous substances (dust, fumes etc) • Monitors exposure of workers to hazardous substances • Ensures correct handling and storage of hazardous substances • Ensures appropriate training and use of PPE	4	brief description 1 mark detailed description 2 mark **Two** features clearly described

Question	Answer	Mark	Guidance
(d)	Descriptions **Solar photovoltaic** Photovoltaic cells convert light to electricity, using large panels placed in full sunlight on roofs, fields etc. Often use inverters to raise output voltage. Benefit Low cost after initial outlay, no pollutants or waste, used in small or large scale in remote areas. **Hydro-electric** Dam is used to trap water, water released when electricity is required - turns turbines, turbines turn generators, electricity distributed. Benefit Once dam built, very low cost, no air pollution, reliable, up to full power very quickly. **Tidal Barrage** Barrage built across river estuary, turbines turn as tide enters (and when tide leaves), or relies on height difference between high/low tide, turbines turn generators, electricity distributed. Benefit Low cost after initial outlay, No pollutants or waste, Predictable.	**4**	**Level 1 (0-2 marks)** limited description 0 – 1 benefit outlined 0 - 1 **Level 2 (3 - 4 marks)** Explanation Key points included (may include sketch) up to 2 marks Benefit outlined 1 mark Benefit explained 2 marks

Question			Answer	Mark	Guidance
	(e)	(i)	**Material could be:** • Corrugated Cardboard • Correx **Properties or characteristics** • Cost effective for a semi disposable item • Recyclable • Lightweight so one person can erect.	**3**	award mark for other appropriate material not listed 1x1 mark Award mark for other appropriate property/characteristic 2x1 mark
		(ii)	Die Cut • The design is finalised • Tessellated for cost effectiveness. If appropriate • A press forme/ die cutter is manufactured to press these shapes out of the board using mdf. • This is made up of cutting and creasing knives dependent upon the design (Sketches to show where the knives should be placed). • Foam is placed around these knives • The dies are placed in a flat bed machine for this type of production run and the process is automated. • Pressure is applied to each 'box and released • The template drops out and the process carries on. • This can also be completed by hand • The final product is checked to assure QA		**Level 3 (5-6 marks)** Process fully described, key features and technical details identified, Answer must include detail of specialist tooling for full marks. **Level 2 (3-4 marks)** Key stages presented, reasonably well described with key features identified **Level 1 (0-2 marks)** Some stages outlined (up to 2), very limited description **Quality of description and communication** Basic sketch or chart with limited annotation **1** mark Good sketch/chart with main features identified and labelled **2** marks

Question			Answer	Mark	Guidance
				9	Detailed sketch/chart with clear annotation **3** marks Max 1 if no sketch/chart used Award credit where possible if response doesn't link to chosen material.
	(f)		Issues could be: • Rapidly changing fashion in social communication • Availability of creative advertising, video clips, animations • Greater target marketing (radio, Internet, TV) • Wider market coverage, on the go devices examples • Radio – some stations (Talk Sport) target male audience • Vast increase in Internet advertising • Target market info gained from Facebook/Twitter/Google and other social sites.	8	**Level 3 (6-8 marks)** Clear, cogent and well-structured response with two or three issues well explained. Good use of examples and additional evidence to support discussion. Good use of technical vocabulary **Level 2 (3-5 marks)** One or two issues described with some explanation. Appropriate use of technical vocabulary demonstrating a good understanding of concept. Introduction of one example or supporting evidence **Level 1 (0-2 marks)** Some issues outlined, bullet points (usually focussed on one issue) no further or very limited explanation, limited use of examples or supporting evidence
					Q4 Total Mark 36

MARK SCHEME: Manufacturing

Question			Answer	Mark	Guidance
5	(a)		• The height of the seat must suit the age group of the child • The toy should be brightly coloured to attract the child's attention • The toy must have no sharp edges or pinch points • Be resistant to wet weather in case it is used/left outside • It must be stable in use to prevent falling off • Must be strong enough to support the weight of the child • Be reasonably comfortable for the child to sit on • The toy must be robust to prevent damage from knocks • All moving parts must be firmly fixed onto the toy to prevent them coming off in use	**4**	Clear statement and justification required for a mark Must be related to product – no marks for generic responses Must be a full response - no marks for identification only. **Four** justified design requirements. Give one mark if two valid points given but not justified.
	(b)		Benefits of computerised stock control could be: • Lower costs to operate (could result in lower cost to consumer) • Improved efficiency • Caters for fluctuating levels of demand • Very quick system • Data can be itemised for presentations to different audiences • Data can be quickly printed or digitally shared/stored.	**4**	brief description 1 mark detailed description 2 marks **Two** benefits clearly described
	(c)		Key features could be: • Prevention of harm caused by chemicals or hazardous substances (dust, fumes etc)		brief description 1 mark detailed description 2 marks

Question			Answer	Mark	Guidance
			• Monitors exposure of workers to hazardous substances • Ensures correct handling and storage of hazardous substances • Ensures appropriate training and use of PPE	4	**Two** features clearly described
	(d)		Descriptions **Solar photovoltaic** Photovoltaic cells convert light to electricity, using large panels placed in full sunlight on roofs, fields etc. Often use inverters to raise output voltage. Benefit Low cost after initial outlay, no pollutants or waste, used in small or large scale in remote areas. **Hydro-electric** Dam is used to trap water, water released when electricity is required - turns turbines, turbines turn generators, electricity distributed. Benefit Once dam built, very low cost, no air pollution, reliable, up to full power very quickly. **Tidal Barrage** Barrage built across river estuary, turbines turn as tide enters (and when tide leaves), or relies on height difference between high/low tide, turbines turn generators, electricity distributed. Benefit Low cost after initial outlay,		**Level 1 (0-2 marks)** limited description 0 – 1 benefit outlined 0 - 1 **Level 2 (3 - 4 marks)** Explanation Key points included (may include sketch) up to 2 marks

Question			Answer	Mark	Guidance
			No pollutants or waste, Predictable.	 **4**	 Benefit outlined 1 mark Benefit explained 2 marks
	(e)	**(i)**	**Materials**: Any appropriate thermoplastic eg: PP, HIPS, PVC, ABS Mild steel sheet **Properties/characteristics:** Easy to form into shape required Available in a range of colours / doesn't need finishing Relatively inexpensive material Readily recyclable at end-of-life Easily accepts surface finishing processes	 **3**	Award mark for other *appropriate* material not listed 1 x 1 mark Award mark for other appropriate property/characteristic. Must relate to the specific material given. eg : not 'range of colours' if mild steel given. 2 x 1 mark
		(ii)	Accept blow moulding, rotational moulding or fabrication processes. **Blow moulding:** • Split mould prepared • Soft thermoplastic 'parison' fed into mould • Mould closed onto parison • Air blown in to spread plastic against walls of mould • Mould opened and cooled moulding removed • QC - visual or scanned check for complete moulding • Mould 'flash' removed from moulding • Moulding mounted in fixture to cut holes for steering and wheels • QC final check before assembly **Rotational moulding:** • Split mould prepared • Measured amount of plastic powder inserted • Mould attached to 2 axis rotating device		**Level 3 (5-6 marks)** Process fully described, key features and technical details identified, Answer must include detail of specialist tooling for full marks. **Level 2 (3-4 marks)** Key stages presented, reasonably well described with key features identified **Level 1 (0-2 marks)** Some stages outlined (up to 2), very limited description **Quality of description and communication** Basic sketch or chart with limited annotation **1** mark Good sketch/chart with main features identified

Question			Answer	Mark	Guidance
			• Rotating device activated, heat applied until shape formed • Rotation continues – heat reduced to allow setting • Shape extracted, any flash removed **Fabrication:** Bodyshell halves produced by vacuum forming, injection moulding, or presswork if metal used. Vacuum forming:- • mould (plug) halves produced • plastic sheet clamped in m/c above moulds • plastic sheet heated until softened • Moulds raised and vacuum turned on • Heat and vacuum off - mould lowered • Plastic sheet removed from machine • QC - visual or scanned check for completeness of moulding • Waste plastic cropped from bodyshell halves Injection moulding:- • Split mould required for each bodyshell half • Mould closed • Molten plastic injected Mould opened and cooled moulding removed • QC - visual or scanned check for complete moulding • Removal of 'flash' Then:- • Bodyshell halves assembled in jig / fixture for solvent / laser welding *Accept 'clip-together' halves if described* • QC check for accuracy of finished shell • Removal of 'flash'		and labelled **2** marks Detailed sketch/chart with clear annotation **3** marks Max 1 if no sketch/chart used Award credit where possible if response doesn't link to chosen material.

Question			Answer	Mark	Guidance
			• Cutting of holes and final QC check as for blow moulding	9	
	(f)		Issues could be: • Rapidly changing fashion in social communication • Availability of creative advertising, video clips, animations • Greater target marketing (radio, Internet, TV) • Wider market coverage, on the go devices examples • Radio – some stations (Talk Sport) target male audience • Vast increase in Internet advertising • Target market info gained from Facebook/Twitter/Google and other social sites.	8	**Level 3 (6-8 marks)** Clear, cogent and well-structured response with two or three issues well explained. Good use of examples and additional evidence to support discussion. Good use of technical vocabulary **Level 2 (3-5 marks)** One or two issues described with some explanation. Appropriate use of technical vocabulary demonstrating a good understanding of concept. Introduction of one example or supporting evidence **Level 1 (0-2 marks)** Some issues outlined, bullet points (usually focussed on one issue) no further or very limited explanation, limited use of examples or supporting evidence
					Q5 Total Marks 36

MARK SCHEME: Resistant Materials

Question			Answer	Mark	Guidance
6	(a)		• The tricycle must be robust as children will treat it roughly • The tricycle must be suit the ergonomic requirements of a 3 – 5 year old child (specific, explained anthropometric requirements handlebars, seat, crank length, pedal) • The tricycle must be well assembled so that parts cannot come loose in usage • The tricycle could be built to be self-assembly to reduce storage and transport costs • The tricycle should be constructed from materials that can withstand outdoor conditions.	4	Clear statement and justification required for a mark Must be related to the product – no marks for generic responses Must be a full response – - no marks for identification only. **Four** justified design requirements. Give one mark if two valid points given but not fully justified.
	(b)		Benefits of computerised stock control could be: • Lower costs to operate (could result in lower cost to consumer) • Improved efficiency • Caters for fluctuating levels of demand • Very quick system • Data can be itemised for presentations to different audiences • Data can be quickly printed or digitally shared/stored.	4	brief description 1 mark detailed description 2 mark **Two** benefits clearly described
	(c)		Key features could be: • Prevention of harm caused by chemicals or hazardous substances (dust, fumes etc) • Monitors exposure of workers to hazardous substances • Ensures correct handling and storage of hazardous substances • Ensures appropriate training and use of PPE	4	brief description 1 mark detailed description 2 mark **Two** features clearly described

Question			Answer	Mark	Guidance
	(d)		Descriptions **Solar photovoltaic** Photovoltaic cells convert light to electricity, using large panels placed in full sunlight on roofs, fields etc. Often use inverters to raise output voltage. Benefit Low cost after initial outlay, no pollutants or waste, used in small or large scale in remote areas. **Hydro-electric** Dam is used to trap water, water released when electricity is required - turns turbines, turbines turn generators, electricity distributed. Benefit Once dam built, very low cost, no air pollution, reliable, up to full power very quickly. **Tidal Barrage** Barrage built across river estuary, turbines turn as tide enters (and when tide leaves), or relies on height difference between high/low tide, turbines turn generators, electricity distributed. Benefit Low cost after initial outlay, No pollutants or waste, Predictable.	**4**	**Level 1 (0-2 marks)** limited description 0 – 1 benefit outlined 0 - 1 **Level 2 (3 - 4 marks)** Explanation Key points included (may include sketch) up to 2 marks Benefit outlined 1 mark Benefit explained 2 marks

Question			Answer	Mark	Guidance
	(e)	(i)	**Part A – Front forks** • Mild steel • Aluminium alloy **Properties or characteristics** • rigid; • appropriate strength, stiffness • can be bent to shape • accepts appropriate finish (named). **Part B - Frame** • beech • other appropriate hardwood • birch (laminated) • ABS • Steel or aluminium box section • Sheet steel or aluminium fabricated into a box **Properties or characteristics** • Easily machined to shape • Relatively lightweight • Rigid/ (very slight give if laminated) • accepts appropriate finish (named) **Part C - Seat** • HDPE • ABS • PP • Aluminium alloy		award mark for other appropriate material not listed 1x1 mark Award mark for other appropriate property/characteristic 2x1 mark

Question			Answer	Mark	Guidance
			• Birch (or other hardwood laminated) • Flexy-ply (or plywood) **Properties or characteristics** • Available in range of colours; • Easily shaped/formed/laminated; • Slight give, comfortable • accepts appropriate finish (named)	**3**	
		(ii)	**Part A – Front forks** • Marked out and cut to shape (hack saw/file) • Holes punched and drilled, appropriate jig/clamping for relatively large size holes • Former or bending jig used to accurately bend to shape • Primer/paint applied **Part B - Frame** Solid material • Tessellate shape • Consider grain direction • Band saw to shape or CNC router • Drum sand to achieve appropriate finish • Use router for rounded edges • Drill using jig/clamping system • Apply appropriate finish Lamination • Cut veneers to size • Former created (could be multiple former)		**Level 3 (5-6 marks)** Process fully described, key features and technical details identified, Answer must include detail of specialist tooling for full marks. **Level 2 (3-4 marks)** Key stages presented, reasonably well described with key features identified **Level 1 (0-2 marks)** Some stages outlined (up to 2), very limited description **Quality of description and communication** Basic sketch or chart with limited annotation **1** mark Good sketch/chart with main features identified and labelled **2** marks Detailed sketch/chart with clear annotation **3** marks Max 1 if no sketch/chart used Award credit where possible if response doesn't link to chosen material.

Question			Answer	Mark	Guidance
			• Protective layer on former faces • Adhesive applied to faces of veneer • Positioned in former • Clamps activated • Left to cure • Shape with band saw/drum sander/router • Drill using jig/clamping system • Apply appropriate finish **Part C- Seat** Forming/heat • Former created (perfect finish) must have some detail eg. draft angles and extraction holes • Placed in vacuum former • Plastic heated • Vacuum applied • Trim and finish (rout or drill and cut for hole at back of seat) • Could be two part press former Lamination • Cut veneers to size • Former created (could be multiple former) • Protective layer on former faces • Adhesive applied to faces of veneer • Positioned in former • Clamps activated • Left to cure • Shape with band saw/drum sander/router • Drill/rout out shape at back of seat • Apply appropriate finish	**9**	

Question			Answer	Mark	Guidance
	(f)		Issues could be: • Rapidly changing fashion in social communication • Availability of creative advertising, video clips, animations • Greater target marketing (radio, Internet, TV) • Wider market coverage, on the go devices examples • Radio – some stations (Talk Sport) target male audience • Vast increase in Internet advertising • Target market info gained from Facebook/Twitter/Google and other social sites.	8	**Level 3 (6-8 marks)** Clear, cogent and well-structured response with two or three issues well explained. Good use of examples and additional evidence to support discussion. Good use of technical vocabulary **Level 2 (3-5 marks)** One or two issues described with some explanation. Appropriate use of technical vocabulary demonstrating a good understanding of concept. Introduction of one example or supporting evidence **Level 1 (0-2 marks)** Some issues outlined, bullet points (usually focussed on one issue) no further or very limited explanation, limited use of examples or supporting evidence
					Q6 Total Mark 36

MARK SCHEME: Systems and control

Question			Answer	Mark	Guidance
7	(a)		• The kettle should automatically switch off once the water has boiled to conserve energy. • The kettle should be stable so it does not easily topple over to avoid accidents. • It should be possible to fill the kettle without opening the lid for convenience in use. • It should be possible to see how much water the kettle contains to avoid having to open the lid. • The kettle should boil water rapidly to avoid the user having to wait too long. • The kettle should hold a sufficient quantity of water to avoid having to repeatedly refill it. • The kettle should lift off the base so that there is no trailing cord during use, for safety. • The kettle should have the ability to keep water warm so that hot water is always available for use.	**[4]**	Clear statement and justification required for a mark Must be related to the product – no marks for generic responses Must be a full response – - no marks for identification only. **Four** justified design requirements. Give one mark if two valid points given but not fully justified.
	(b)		Benefits of computerised stock control could be: • Lower costs to operate (could result in lower cost to consumer) • Improved efficiency • Caters for fluctuating levels of demand • Very quick system • Data can be itemised for presentations to different audiences • Data can be quickly printed or digitally shared/stored.	**4**	brief description 1 mark detailed description 2 mark **Two** benefits clearly described
	(c)		Key features could be: • Prevention of harm caused by chemicals or hazardous substances (dust, fumes etc) • Monitors exposure of workers to hazardous substances		brief description 1 mark detailed description 2 mark **Two** features clearly described

Question			Answer	Mark	Guidance
			• Ensures correct handling and storage of hazardous substances • Ensures appropriate training and use of PPE	4	
	(d)		Descriptions **Solar photovoltaic** Photovoltaic cells convert light to electricity, using large panels placed in full sunlight on roofs, fields etc. Often use inverters to raise output voltage. Benefit Low cost after initial outlay, no pollutants or waste, used in small or large scale in remote areas. **Hydro-electric** Dam is used to trap water, water released when electricity is required - turns turbines, turbines turn generators, electricity distributed. Benefit Once dam built, very low cost, no air pollution, reliable, up to full power very quickly. **Tidal Barrage** Barrage built across river estuary, turbines turn as tide enters (and when tide leaves), or relies on height difference between high/low tide, turbines turn generators, electricity distributed. Benefit Low cost after initial outlay, No pollutants or waste, Predictable.	4	**Level 1 (0-2 marks)** limited description 0 – 1 benefit outlined 0 - 1 **Level 2 (3 - 4 marks)** Explanation Key points included (may include sketch) up to 2 marks Benefit outlined 1 mark Benefit explained 2 marks

Question			Answer	Mark	Guidance
	(e)	(i)	Sensor: thermistor or temperature-sensing IC. A thermistor should be placed in a potential divider circuit to produce an output voltage signal. The temperature-sensing IC directly produces an output voltage so candidates should receive credit providing the connections to the IC are identified.	3	Sensor named 1 mark Clear diagram 1 mark Principle of operation clear 1 mark
		(ii)	Candidates should produce a circuit diagram to process the signal from the named sensor and produce an output which switches when the sensor reaches a specific temperature. For full credit, it should be clear how the output is used to switch a mains-powered kettle element. There are a number of different ways of achieving this. Expected answers might include <u>some</u> of the following features: • Voltage comparator to compare the analogue sensor voltage to a reference. • Reference voltage from a potential divider. • Variable resistor to adjust switching temperature. • Power supply lines identified. • Use of a programmable microcontroller (e.g. PIC or GENIE) with input/output connections to appropriate transducers. An accompanying program flowchart must be given for full marks to be awarded. • Analogue-to-digital converter. • Use of a transistor/MOSFET to buffer the output from the control circuit. • Use of a relay to switch the mains circuit.	9	**Level 3 (5-6 marks)** Clear and correctly functional circuit diagram with few errors. Operation of circuit correctly described and good use of technical vocabulary. **Level 2 (3-4 marks)** Clear circuit diagram containing some relevant functional features. Candidate has attempted to describe operation of circuit. **Level 1 (0-2 marks)** Attempt at a circuit diagram with little relevance to the application. Circuit operation not described. **Quality of description and communication** Circuit diagram with some correct BSI symbols **1** mark Complete circuit diagram with mostly correct BSI symbols **2** marks Complete circuit diagram with correct BSI symbols and appropriate annotation (e.g. labelled power supply) **3** marks

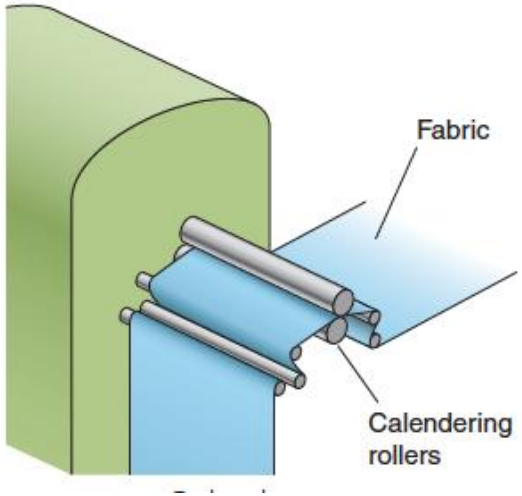
Question			Answer	Mark	Guidance
	(f)		Issues could be: • Rapidly changing fashion in social communication • Availability of creative advertising, video clips, animations • Greater target marketing (radio, Internet, TV) • Wider market coverage, on the go devices examples • Radio – some stations (Talk Sport) target male audience • Vast increase in Internet advertising • Target market info gained from Facebook/Twitter/Google and other social sites.	8	**Level 3 (6-8 marks)** Clear, cogent and well-structured response with two or three issues well explained. Good use of examples and additional evidence to support discussion. Good use of technical vocabulary **Level 2 (3-5 marks)** One or two issues described with some explanation. Appropriate use of technical vocabulary demonstrating a good understanding of concept. Introduction of one example or supporting evidence **Level 1 (0-2 marks)** Some issues outlined, bullet points (usually focussed on one issue) no further or very limited explanation, limited use of examples or supporting evidence
					Q7 Total Mark 36

MARK SCHEME: Textiles

Question			Answer	Mark	Guidance
8	(a)		• The pyjamas must be flame proof as they are for children /to comply with regulations • The pyjamas must be front fastening to allow a child to put them on and off easily • The trousers must be elasticated at the waist to allow ease of taking off and on / to give a comfortable loose fit for sleeping in • There must be no loose parts (ties/straps) for safety • The fabric must be printed with a modern appealing design • Design to be unisex to appeal to a wider market • Must be made from a warm fabric so they are for the winter.	4	Clear statement and justification required for a mark Must be related to the product – no marks for generic responses Must be a full response – - no marks for identification only. **Four** justified design requirements. Give one mark if two valid points given but not fully justified.
	(b)		Benefits of computerised stock control could be: • Lower costs to operate (could result in lower cost to consumer) • Improved efficiency • Caters for fluctuating levels of demand • Very quick system • Data can be itemised for presentations to different audiences • Data can be quickly printed or digitally shared/stored. • Can quickly respond to consumer demands	4	brief description 1 mark detailed description 2 mark **Two** benefits clearly described
	(c)		Key features could be: • Prevention of harm caused by chemicals or hazardous substances (dust, fumes etc) • Monitors exposure of workers to hazardous substances • Ensures correct handling and storage of hazardous	4	brief description 1 mark detailed description 2 mark **Two** features clearly described

Question			Answer	Mark	Guidance
			substances • Ensures appropriate training and use of PPE		
	(d)		Descriptions **Solar photovoltaic** Photovoltaic cells convert light to electricity, using large panels placed in full sunlight on roofs, fields etc. Often use inverters to raise output voltage. Benefit Low cost after initial outlay, no pollutants or waste, used in small or large scale in remote areas. **Hydro-electric** Dam is used to trap water, water released when electricity is required - turns turbines, turbines turn generators, electricity distributed. Benefit Once dam built, very low cost, no air pollution, reliable, up to full power very quickly. **Tidal Barrage** Barrage built across river estuary, turbines turn as tide enters (and when tide leaves), or relies on height difference between high/low tide, turbines turn generators, electricity distributed. Benefit Low cost after initial outlay, No pollutants or waste, Predictable.	4	**Level 1 (0-2 marks)** limited description 0 – 1 benefit outlined 0 - 1 **Level 2 (3 - 4 marks)** Explanation Key points included (may include sketch) up to 2 marks Benefit outlined 1 mark Benefit explained 2 marks

Question			Answer	Mark	Guidance
	(e)	(i)	**Fabric could be:** Any of the fibres below either on their own or as blend in the form of jersey/ knit/towelling/velour/ brushed woven. • Viscose • Cotton • Polyester • Polyamide /nylon **Properties or characteristics** **Viscose or Cotton fabrics** • Absorbent so comfortable to wear • Comfortable next to the skin • Soft feel so comfortable • Warm to wear • Washable • Non irritating • Non static • Dyes well **Polyester / Nylon fabrics** • Brushed/textured give good insulation (not on its own) • Very easy to wash and dry (not absorbent) • Strong are resilient and durable • Good crease resistance maintain shape • Soft and lightweight • Polyester dyes well	**3**	award mark for other appropriate material not listed 1x1 mark Award mark for other appropriate property/characteristic 2x1 mark
		(ii)	Transfer printing: • Design produced and reversed • Printed onto special paper using specific dyes • Paper is placed ink side down onto the fabrics • Heated pressurised calendar is rolled over the fabric • The temperature is very high		**Level 3 (5-6 marks)** Process fully described, key features and technical details identified, Answer must include detail of specialist terms for full marks. /Vapour/Sublimation/diffuse

Question			Answer	Mark	Guidance
			• Causes the dye to pass into the vapour stage – sublimation • Dye travels into the fabric and diffuses into fibres of the fabric • No fixing is needed as the dye is transferred by heat  	9	**Level 2 (3-4 marks)** Key stages presented, reasonably well described with key features identified **Level 1 (0-2 marks)** Some stages outlined (up to 2), very limited description **Quality of description and communication** Basic sketch or chart with limited annotation **1** mark Good sketch/chart with main features identified and labelled **2** marks Detailed sketch/chart with clear annotation **3** marks Max 1 if no sketch/chart used Award credit where possible if response doesn't link to industrial production .
	(f)		Issues could be: • Rapidly changing fashion in social communication • Availability of creative advertising, video clips, animations • Greater target marketing (radio, Internet, TV) • Wider market coverage, on the go devices examples • Radio – some stations (Talk Sport) target male audience		**Level 3 (6-8 marks)** Clear, cogent and well-structured response with two or three issues well explained. Good use of examples and additional evidence to support discussion. Good use of technical vocabulary **Level 2 (3-5 marks)** One or two issues described with some explanation. Appropriate use of technical vocabulary demonstrating a good understanding of concept. Introduction of one example or supporting evidence **Level 1 (0-2 marks)**

Question			Answer	Mark	Guidance
			• Vast increase in Internet advertising • Target market info gained from Facebook/Twitter/Google and other social sites.	8	Some issues outlined, bullet points (usually focussed on one issue) no further or very limited explanation, limited use of examples or supporting evidence
					Q8 Total Mark 36

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