

GCE

Design and Technology

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

Advanced GCE

Mark Scheme for June 2015

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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.

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Annotation	Meaning of annotation
	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.

Question		Answer	Mark	Guidance
1	(a)	<p>Justified design requirements for the lintel:</p> <ul style="list-style-type: none"> • The lintel must be capable of supporting the loads imposed on it without excessive deflection. • Length ie where the clear span (distance between the reveals) of the opening is 1200mm or less the lintel must have a bearing on each side of the load bearing wall of a minimum of 100mm. For openings greater than 1200mm the bearing must be a minimum of 150mm. • The lintel must satisfy the requirements of the Building Regulations Part L in terms of heat loss from the building ie thermal bridging. Usually the incorporation of insulation in the lintel's hollow core will satisfy this requirement. • A damp proof course (DPC) or integral damp proof tray must be incorporated with the lintel to prevent the passage of rainwater across the cavity to the inner leaf of the wall. • The sustainability of the lintel, embodied energy and eventual re-use/recycle at the end of its life. • The lintel should be manufactured to resist corrosion through moisture or water vapour ie. galvanised or stainless steel. • The lintel should conform to BS476 Methods of Determination of the Fire Resistance of load bearing Elements of Construction. • The cost of the lintel. 	4	<p>Clear statement and justification required for a mark</p> <p>Must be related to the product – no marks for generic responses</p> <p>Must be a full response – - no marks for identification only.</p> <p>Four justified design requirements.</p> <p>Give one mark if two valid points given but not fully justified.</p>
	(b)	<p>Ergonomics considered in:</p> <ul style="list-style-type: none"> • Clarity / view through window • Ease of use of handles • Positioning of window - viewing • Positioning of handles • Simplicity of operations for user 	4	<p>brief description 1 mark detailed description 2 mark</p> <p>Two ergonomic considerations clearly described</p>

Question		Answer	Mark	Guidance
	(c)	<p>Principles Software 'slices up' object into horizontal layers, sent in sequence to machine to build up 3D item</p> <p>methods :</p> <ul style="list-style-type: none"> • Laminated Object manufacturing -layers of adhesive coated materials • Stereo Lithography – traces shape onto bath of resin • 3D printing / Fused deposition modelling(FDM) • Selective Laser Sintering(SLS) 	4	<p>brief description of principles 1 mark detailed description of principles 2 marks</p> <p>Two methods described 1 x 2</p>
	(d)	<p>Features could be:</p> <ul style="list-style-type: none"> • Flexible system • Batches of a few items to several thousand • Reacts to market demand • Medium investment needed for a range of machinery that can be set up for different operations • Workforce often trained to operate more than one machine 	4	<p>Level 2 (3 - 4 marks)</p> <p>Detailed explanation, demonstrating clear understanding of batch production.</p> <p>Level 1 (0 – 2 marks)</p> <p>Brief description/statements of features of batch production, limited explanation</p>

Question		Answer	Mark	Guidance
	(e) (i)	<p>Material for lintel</p> <p>Steel with galvanised finish or Stainless steel</p> <p>Properties or characteristics</p> <ul style="list-style-type: none"> • Strength – resistance to fracture • Malleability – can be rolled into sheet form • Durability – long lasting and resistant to wear • Ductility – can be stretched, drawn out or pressed into different shapes • Alloying – other chemicals can change its properties e.g. chromium, nickel, molybdenum, manganese for stainless steel • Accepts a coating e.g. zinc. <p>Material for lintel</p> <p>Concrete</p> <p>Properties or characteristics</p> <ul style="list-style-type: none"> • Strength – gains compressive strength over time • Strength - tensile strength when reinforced with steel • Versatility – easily formed to the required shape • Fire resistant • Durability – long lasting and resistant to wear • Impermeable to water • Low coefficient of expansion 	3	<p>award mark for other appropriate material not listed</p> <p>1x1 mark</p> <p>Award mark for other appropriate property/characteristic</p> <p>2x1 mark</p>

Question	Answer	Mark	Guidance
	<p>(ii) Construction of the brick arch</p> <ul style="list-style-type: none"> • Prepare a full size drawing of the arch • Using the details of the drawing construct a temporary support (centre) for the arch bricks (voussoirs) from expanded polystyrene, plywood or a traditional open timber framework. Permanent metal arch supports that incorporate a cavity tray can be used. • Raise the brickwork abutments on both sides of the arch to the level of the 'springing' line • Raise the arch centre to the springing line, place on folding wedges and timber supports/props on each side of the opening • Ensure the arch centre is plumb on its face before laying the arch bricks • Using the details of the drawing mark the positions of the arch bricks around the arch centre again prior to laying the arch bricks • Set bricks dry on the arch centre using foam strips between each brick to act as the mortar joint and so check the setting out • Lay the arch bricks alternatively from each side of the centre ensuring each brick is square across the soffit and is plumb • Complete the arch by setting the key brick at the crown <p>When the arch is self-supporting i.e. the mortar joints have hardened remove (strike) the temporary arch support</p>	9	<p>Level 3 (5-6 marks) Process fully described, key features and technical details identified, Use of correct terminology for award of full marks.</p> <p>Level 2 (3-4 marks) Key stages presented, reasonably well described with key features identified</p> <p>Level 1 (0-2 marks) Some stages outlined (up to 2), very limited description</p> <p>Quality of description and communication</p> <p>Basic sketch with limited annotation 1 mark</p> <p>Good sketch with main features identified and labelled 2 marks</p> <p>Detailed sketch with clear annotation 3 marks</p> <p>Max 1 if no sketch used</p> <p>Award credit where possible if response doesn't link to chosen material.</p>

Question	Answer	Mark	Guidance
(f)	<p>Issues could be:</p> <ul style="list-style-type: none"> • Consumer rights protection, • Defective goods Safety /functional issues • Cost implications • Length of time dealing with issues/courts/citizen advice • Product labelling <p>examples</p> <ul style="list-style-type: none"> • Trade Descriptions Act 1968 • Sale of Goods Act 1979 • Appropriate reference to BSI/CE approval • Warranties • Age specific labelling • Allergen information • Specific product / company examples 	8	<p>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</p> <p>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</p> <p>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. Award credit where possible if response links to legislation.</p>
Q1 Total Mark 36			

Question		Answer	Mark	Guidance
2	(a)	<ul style="list-style-type: none"> The litter bin must be sturdy/durable to withstand everyday use. The base of the bin should be large enough to prevent the bin toppling when used. It must be easy to place litter in the bin in order to encourage people to use it. The material used for the bin must be resistant to all weather conditions as it may be used in exposed places. The bin should hold a substantial amount of litter without overflowing. Internal liners/bags should be easy to remove for emptying. The outer surface of the litter bin should be easily cleaned to remove dirt and graffiti. The bin should have a secure fitting lid that cannot be removed by unauthorised people. The bin should have provision for fixing it in position to prevent it being pushed over or removed. The bin must be easily recognised as to its purpose in order to ensure that it is used properly. 	4	<p>Four justified design requirements.</p> <p>Clear statement and justification required for a mark</p> <p>Must be related to product – no marks for generic responses</p> <p>Must be a full response - no marks for identification only.</p> <p>Give one mark if two valid points given but not justified.</p>
	(b)	<p>Ergonomics considered in:</p> <ul style="list-style-type: none"> Anthropometric data – hand size in relation to slot in bin Anthropometric data – height of users in relation to position of slot Simplicity of use – not complex design Smoothness of surfaces to avoid injury/encourage use Ease of removal of lid/internal bag/bin for emptying Use of colour/logos to make bin stand out. 	4	<p>brief description 1 mark detailed description 2 marks</p> <p>Two ergonomic considerations clearly described</p>

Question		Answer	Mark	Guidance
	(c)	<p>Principles Software 'slices up' object into horizontal layers, sent in sequence to machine to build up 3D item</p> <p>methods :</p> <ul style="list-style-type: none"> • Laminated Object manufacturing -layers of adhesive coated materials • Stereo Lithography – traces shape onto bath of resin • 3D printing / Fused deposition modelling(FDM) • Selective Laser Sintering(SLS) 	4	<p>brief description of principles 1 mark detailed description of principles 2 marks</p> <p>Two described 1 x 2</p>
	(d)	<p>Features could be:</p> <ul style="list-style-type: none"> • Flexible system • Batches of a few items to several thousand • Reacts to market demand • Medium investment needed for a range of machinery that can be set up for different operations • Workforce often trained to operate more than one machine 	4	<p>Level 2 (3 - 4 marks)</p> <p>Detailed explanation, demonstrating clear understanding of batch production.</p> <p>Level 1 (0 – 2 marks)</p> <p>Brief description/statements of features of batch production, limited explanation</p>
	(e) (i)	<p>Materials: Cast iron Aluminium alloy HDPE Polypropylene ABS PVC Polycarbonate Nylon EVA</p> <p>Properties/characteristics: Easy to form into shape required Relatively inexpensive material Comparatively heavy for stability</p>		<p>Award mark for other <i>appropriate</i> metal not listed</p> <p>1 x 1 mark</p> <p>Award mark for other appropriate property/characteristic. Must relate to the specific material given. eg: not 'comparatively heavy' if aluminium alloy.</p>

Question	Answer	Mark	Guidance
	Readily recyclable at end-of-life Corrosion resistance / readily takes surface finish Gives a decorative / quality appearance Produces suitably rigid structure Material is durable for extended/external use	3	2 x 1 mark
	<p>(ii)</p> <ul style="list-style-type: none"> • CAD software used to produce mould / pattern design. <p>Metal casting:</p> <ul style="list-style-type: none"> • Pattern produced using CAM equipment from CAD produced design: • Wooden / metal pattern – machined on CNC equipment. <p>Details of mould features to be shown/given.</p> <ul style="list-style-type: none"> • Mould produced from pattern - packed sand • Pattern removed • QC – check completeness of mould and remove excess sand. • ‘Cores’ put in place to produce hollow bin (and slots for litter). <p>* Allow suitably detailed description of ‘centrifugal casting’ as alternative *</p> <ul style="list-style-type: none"> • Produce ‘runners and risers’ to complete the mould. • Fill mould with molten metal and leave to cool. • Remove casting from mould and cores from casting. • QC – check casting is complete and sound. • Slots for litter machined on CNC milling machine if not ‘cored’. • QC – final check and clean for surface finishing. 		<p>Level 3 (5-6 marks) Process fully described, key features and technical details identified, Answer must include detail of specialist tooling for full marks.</p> <p>Level 2 (3-4 marks) Key stages presented, reasonably well described with key features identified</p> <p>Level 1 (0-2 marks) Some stages outlined (up to 2), very limited description</p> <p>Quality of description and communication</p> <p>Basic sketch or chart with limited annotation 1 mark</p> <p>Good sketch/chart with main features identified and labelled 2 marks</p> <p>Detailed sketch/chart with clear annotation 3 marks</p> <p>Max 1 if no sketch/chart used</p>

Question	Answer	Mark	Guidance
	<p>Rotational or Blow moulding:</p> <ul style="list-style-type: none"> • Mould parts produced using CNC equipment from CAD produced design. <p>Details of mould features to be shown/given.</p> <ul style="list-style-type: none"> • Add measured amount of polymer granules to mould. • Assemble mould parts. • Fit assembled mould to rotation equipment and place in oven. • (Rotational moulding only) Set rotation in motion to ensure even thickness of bin (adequate description of ‘tumbling’ procedure required). • Remove moulding from dis-assembled mould. • Remove ‘flash’ and mould lines from finished moulding. • QC - check moulding is complete and sound. • Slots for litter machined on CNC milling machine if not produced by mould features. • QC – final dimensional check. <p>GRP Moulding</p> <ul style="list-style-type: none"> • Two/multi part mould made from basic materials. <p>Details of mould features to be shown/given.</p> <ul style="list-style-type: none"> • Individual sections of mould polished and coated with release agent. • Resin Gel-coat mixed and applied to mould section. • Lay-up resin applied to mould section – brushed or sprayed. • Glass-fibre matting applied to resin – brush stippled/rollered/sprayed. • QC – check matting is well ‘wetted’ with resin and of even thickness. 		Award credit where possible if response doesn’t link to chosen material.

Question	Answer	Mark	Guidance
	<ul style="list-style-type: none"> • Repeat lay-up stages to build up required thickness • Leave moulding to cool/harden. • Remove mouldings from individual mould sections. • QC – quality check of gel-coat finish and removal of 'flashing'. • Assemble parts of bin with internal fixings. • QC – final quality check for soundness and stability. 	9	
(f)	<p>Issues could be:</p> <ul style="list-style-type: none"> • Consumer rights protection, • Defective goods Safety /functional issues • Cost implications • Length of time dealing with issues/courts/citizen advice • Product labelling <p>examples</p> <ul style="list-style-type: none"> • Trade Descriptions Act 1968 • Sale of Goods Act 1979 • Appropriate reference to BSI/CE approval • Warranties • Age specific labelling • Allergen information • Specific product / company examples 	8	<p>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</p> <p>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</p> <p>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. Award credit where possible if response links to legislation.</p>
			Q2 Total Mark 36

Question		Answer	Mark	Guidance
3	(a)	<ul style="list-style-type: none"> The jars must easy to grip when carrying or storing. The jam must be able to be seen through the jars to appeal to customers. The lids must fasten securely and be a good grip as people often carry jars around by the lid. The jars must be able to be stacked in boxes safely for transportation The jam must be a good colour, bright and even and a good characteristic and clearly show the fruit. Fruit evenly distributed Good flavour, fresh and characteristic of the specific fruit Jam of good consistency not runny or sticky 	4	<p>Clear statement and justification required for a mark</p> <p>Must be related to the product – no marks for generic responses</p> <p>Must be a full response – - no marks for identification only.</p> <p>Four justified design requirements.</p> <p>Give one mark if two valid points given but not fully justified.</p>
	(b)	<p>Ergonomics considered in:</p> <ul style="list-style-type: none"> Anthropometric data (thumb/finger) on tightening and undoing the lids Shape of jar to give a good grip and fit in the average hand Texture of lid Easy to grip to transport and move - Simplicity of operations for user 	4	<p>brief description 1 mark detailed description 2 mark</p> <p>Two ergonomic considerations clearly described</p>
	(c)	<p>Principles Software 'slices up' object into horizontal layers, sent in sequence to machine to build up 3D item</p> <p>methods :</p> <ul style="list-style-type: none"> Laminated Object manufacturing -layers of adhesive coated materials Stereo Lithography – traces shape onto bath of resin 3D printing / Fused deposition modelling(FDM) Selective Laser Sintering(SLS) 	4	<p>brief description of principles 1 mark detailed description of principles 2 marks</p> <p>Two methods described 1 x 2</p>

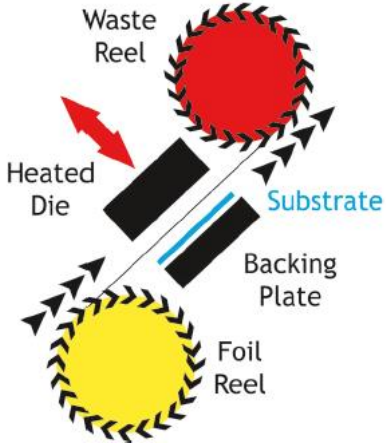
Question		Answer	Mark	Guidance
	(d)	<p>Features could be:</p> <ul style="list-style-type: none"> • Flexible system • Batches of a few items to several thousand • Reacts to market demand • Medium investment needed for a range of machinery that can be set up for different operations • Workforce often trained to operate more than one machine 	4	<p>Level 2 (3 - 4 marks)</p> <p>Detailed explanation, demonstrating clear understanding of batch production.</p> <p>Level 1 (0 – 2 marks)</p> <p>Brief description/statements of features of batch production, limited explanation</p>
	(e) (i)	<p>Functions of Vitamin C</p> <ul style="list-style-type: none"> • Required for growth and helps make collagen, an important protein found in skin, ligaments and walls of blood vessels. • It is essential for the repair of body tissues including the healing of wounds and development of scar tissue • Vitamin C is required for the repair and maintenance of cartilage, bones and teeth • Assists in the formation of red blood cells by helping the absorption of iron from the intestines. Iron is an important building block of blood. • Vital role in the immune system and the function of lymphocytes to fight infection. • It is an antioxidant. It works with vitamin E to block some of the damage caused by free radicals which are by products from the body converting food into energy. This may reduce the risk of coronary heart disease. 	3	<p>award mark for other appropriate material not listed</p> <p>1x1 mark</p> <p>Award mark for other appropriate property/characteristic</p> <p>2x1 mark</p>

Question	Answer	Mark	Guidance
	<p>(ii) Equipment:</p> <ul style="list-style-type: none"> • Stainless steel, thick heavy based pans- ensures an even distribution of heat • Stainless steel wide necked funnels for filling jars • Muslin/jellybag/cheesecloth for straining jellies. • Standard jam jars with lids in 225/350/450g sizes <p>Process:</p> <ul style="list-style-type: none"> • Jam jars must be sterilised by heat (oven)/boiling waterbath/microwave/ • Ensure all foods are fresh, clean and do not show signs of deterioration. • Fruit is simmered to release pectin(a natural setting agent). • High pectin fruits give a good set eg Blackcurrants/apples/plums and Damsons • Medium Pectin fruits vary eg apricots/raspberries • Low Pectin fruits eg Strawberries need additional pectin to be added. • The higher the acid level the better the set. Low Pectin fruits generally benefit from the addition of acid. This also improves the colour and flavour of the jam • Next it is boiled vigorously with sugar to reach setting point (105°C) • For a good set the balance of sugar, pectin and acid must be correct • The fruit must be cooked and pectin releases before sugar is added as sugar inhibits pectin release. • To test for a set: Rolling boil method Flake test Wrinkle test Temperature of 105°C 	9	<p>Level 3 (5-6 marks) Process fully described, key features and technical details identified, Answer must include specialist detail for full marks.</p> <p>Level 2 (3-4 marks) Key stages presented, reasonably well described with key features identified</p> <p>Level 1 (0-2 marks) Some stages outlined (up to 2), very limited description</p> <p>Quality of description and communication</p> <p>Basic sketch or chart with limited annotation 1 mark</p> <p>Good sketch/chart with main features identified and labelled 2 marks</p> <p>Detailed sketch/chart with clear annotation 3 marks</p> <p>Max 1 if no sketch/chart used</p> <p>Award credit where possible if response doesn't link to chosen material.</p> <p>This question could be answered well without diagrams</p>

Question	Answer	Mark	Guidance
	<ul style="list-style-type: none"> • Pour into sterilised jars • Put on jam covers while the jam is hot • Store in a cool place 		
(f)	<p>Issues could be:</p> <ul style="list-style-type: none"> • Consumer rights protection, • Defective goods Safety /functional issues • Cost implications • Length of time dealing with issues/courts/citizen advice • Product labelling <p>examples</p> <ul style="list-style-type: none"> • Trade Descriptions Act 1968 • Sale of Goods Act 1979 • Food labelling Act 1996 • Guideline Daily Amounts to help the understanding of nutrition information • Food Standards agency • HACCP legal since 2006 reduces risk and ensures all food is safe to eat 	8	<p>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</p> <p>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</p> <p>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. Award credit where possible if response links to legislation.</p>
Q3 Total Mark			36

Question		Answer	Mark	Guidance
4	(a)	<ul style="list-style-type: none"> The gift bag must be strong enough to support the weight of a gift without tearing The gift bag must look attractive as it is to be given a present – receiver must appreciate it The gift bag must have effective and comfortable handles to easily transport the gift The material chosen must be able to accept an embossed and foil blocked finish The bag must fold flat for ease of storage/transportation 	4	<p>Clear statement and justification required for a mark</p> <p>Must be related to the product – no marks for generic responses</p> <p>Must be a full response – - no marks for identification only.</p> <p>Four justified design requirements.</p> <p>Give one mark if two valid points given but not fully justified.</p>
	(b)	<p>Ergonomics considered in:</p> <ul style="list-style-type: none"> Handle design Overall size/weight Aesthetics – feel good as it is for a gift Simplicity and ease of use 	4	<p>brief description 1 mark detailed description 2 mark</p> <p>Two ergonomic considerations clearly described</p>
	(c)	<p>Principles Software ‘slices up’ object into horizontal layers, sent in sequence to machine to build up 3D item</p> <p>methods :</p> <ul style="list-style-type: none"> Laminated Object manufacturing -layers of adhesive coated materials Stereo Lithography – traces shape onto bath of resin 3D printing / Fused deposition modelling(FDM) Selective Laser Sintering(SLS) 	4	<p>brief description of principles 1 mark detailed description of principles 2 marks</p> <p>Two examples described 1 x 2</p>

Question		Answer	Mark	Guidance
	(d)	<p>Features could be:</p> <ul style="list-style-type: none"> • Flexible system • Batches of a few items to several thousand • Reacts to market demand • Medium investment needed for a range of machinery that can be set up for different operations • Workforce often trained to operate more than one machine 	4	<p>Level 2 (3 - 4 marks)</p> <p>Detailed explanation, demonstrating clear understanding of batch production.</p> <p>Level 1 (0 – 2 marks)</p> <p>Brief description/statements of features of batch production, limited explanation</p>
	(e) (i)	<ul style="list-style-type: none"> • paper (cartridge) not less than 120 gsm • Thin card 160 gsm • Solid white board (larger luxury gift bags) <p>Properties or characteristics</p> <ul style="list-style-type: none"> • does not tear easily • accepts embossing/foil blocking • good finish • easily available / large sheet 	3	<p>award mark for other appropriate material not listed</p> <p>1x1 mark</p> <p>Award mark for other appropriate property/characteristic</p> <p>2x1 mark</p>
	(ii)	<p>embossing</p> <ul style="list-style-type: none"> • prepare dies (usually brass although sometimes rubber bottom pad) • rounded edges to avoid cutting • can be dry embossed – even gentle pressure applied using press tool • can be heat embossed – heat softens fibres to ensure a more crisp image when pressed 		<p>Level 3 (5-6 marks)</p> <p>Process fully described, key features and technical details identified, Answer must include detail of specialist tooling for full marks.</p> <p>Level 2 (3-4 marks)</p> <p>Key stages presented, reasonably well described with key features identified</p> <p>Level 1 (0-2 marks)</p> <p>Some stages outlined (up to 2), very limited description</p>

Question	Answer	Mark	Guidance
	<p>foil blocking</p> <ul style="list-style-type: none"> heated die used to apply substrate (usually polyester) 	<p>9</p>	<p>Quality of description and communication</p> <p>Basic sketch or chart with limited annotation 1 mark</p> <p>Good sketch/chart with main features identified and labelled 2 marks</p> <p>Detailed sketch/chart with clear annotation 3 marks</p> <p>Max 1 if no sketch/chart used</p> <p>Award credit where possible if response doesn't link to chosen material.</p>
<p>(f)</p>	<p>Issues could be:</p> <ul style="list-style-type: none"> Consumer rights protection, Defective goods Safety /functional issues Cost implications Length of time dealing with issues/courts/citizen advice Product labelling <p>examples</p> <ul style="list-style-type: none"> Trade Descriptions Act 1968 Sale of Goods Act 1979 Appropriate reference to BSI/CE approval Warranties Age specific labelling Allergen information Specific product / company examples 	<p>8</p>	<p>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</p> <p>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</p> <p>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. Award credit where possible if response links to legislation.</p>
<p>Q4 Total Mark 36</p>			

Question		Answer	Mark	Guidance
5	(a)	<ul style="list-style-type: none"> The door knocker should make a sufficient noise to alert occupants. The door knocker should be available in a range of finishes to fit in with the door fittings. The door knocker should be constructed of a material that will withstand external weather conditions. The door knocker should have smooth surfaces to prevent damage to the door or injury to the user. The door knocker should have features which allow it to be easily and securely fixed onto a door. The door knocker should be robust to withstand numerous impacts. The door knocker should have sufficient grip to enable efficient and safe use when being operated. 	4	<p>Clear statement and justification required for a mark</p> <p>Must be related to product – no marks for generic responses</p> <p>Must be a full response - no marks for identification only.</p> <p>Four justified design requirements.</p> <p>Give one mark if two valid points given but not justified.</p>
	(b)	<p>Ergonomics considered in:</p> <ul style="list-style-type: none"> Anthropometric data – hand/finger size in relation to knocker Texture/grip for firm holding Positioned at a height for correct usage Use of colour/finish to make the door knocker aesthetically pleasing Simplicity of use – not complex design 	4	<p>brief description 1 mark detailed description 2 mark</p> <p>Two ergonomic considerations clearly described</p>

Question		Answer	Mark	Guidance
	(c)	<p>Principles Software 'slices up' object into horizontal layers, sent in sequence to machine to build up 3D item</p> <p>methods:</p> <ul style="list-style-type: none"> • Laminated Object manufacturing -layers of adhesive coated materials • Stereo Lithography – traces shape onto bath of resin • 3D printing / Fused deposition modelling(FDM) • Selective Laser Sintering(SLS) 	4	<p>brief description of principles 1 mark detailed description of principles 2 marks</p> <p>Two methods s described 1 x 2</p>
	(d)	<p>Features could be:</p> <ul style="list-style-type: none"> • Flexible system • Batches of a few items to several thousand • Reacts to market demand • Medium investment needed for a range of machinery that can be set up for different operations • Workforce often trained to operate more than one machine 	4	<p>Level 2 (3 - 4 marks) Detailed explanation, demonstrating clear understanding of batch production.</p> <p>Level 1 (0 – 2 marks) Brief description/statements of features of batch production, limited explanation</p>
	(e) (i)	<p>Materials: Cast iron Aluminum alloy Brass Stainless steel</p> <p>Properties/characteristics: Easy to form into shape required Relatively inexpensive material Comparatively heavy for stability Readily recyclable at end-of-life Corrosion resistance / readily takes surface finish Gives a decorative / quality appearance Produces suitably rigid structure</p>	3	<p>Award mark for other <i>appropriate</i> material not listed</p> <p>1 x 1 mark</p> <p>Award mark for other appropriate property/characteristic.</p> <p>Must relate to the specific metal given. eg: not 'relatively inexpensive' if Brass; not 'comparatively heavy' if aluminium alloy.</p> <p>2 x 1 mark</p>

Question	Answer	Mark	Guidance
	<p>(ii)</p> <ul style="list-style-type: none"> • CAD software used to produce pattern design for knocker <p>Metal casting: - sand / die casting or shell moulding</p> <ul style="list-style-type: none"> • Pattern produced using CAM equipment from CAD produced design: Wooden / metal pattern – machined on CNC equipment. <p>Sand casting:</p> <ul style="list-style-type: none"> • 2-part mould produced from pattern - packed sand • Pattern removed • QC – check completeness of mould and remove excess sand. • Produce ‘runners and risers’ to complete the mould. <p>Details of mould features to be shown/given.</p> <ul style="list-style-type: none"> • Fill mould with molten metal and leave to cool. • Remove casting from mould. • QC – check casting is complete and sound. <p>Die casting:</p> <ul style="list-style-type: none"> • Steel dies produced by CNC machining. • Assembled die fitted into pressure die casting machine. <p>Details of mould features to be shown/given.</p> <ul style="list-style-type: none"> • Molten aluminium alloy injected into die. • Die cooled and opened. • Casting removed. • QC - check casting is complete and sound. • Die cooled and process repeated. <p>Shell moulding:</p> <ul style="list-style-type: none"> • Metal pattern plate produced using CNC equipment from CAD produced design. 		<p>Level 3 (5-6 marks) Process fully described, key features and technical details identified, Answer must include detail of specialist tooling for full marks.</p> <p>Level 2 (3-4 marks) Key stages presented, reasonably well described with key features identified</p> <p>Level 1 (0-2 marks) Some stages outlined (up to 2), very limited description</p> <p>Quality of description and communication</p> <p>Basic sketch or chart with limited annotation 1 mark</p> <p>Good sketch/chart with main features identified and labelled 2 marks</p> <p>Detailed sketch/chart with clear annotation 3 marks</p> <p>Max 1 if no sketch/chart used</p> <p>Award credit where possible if response doesn't link to chosen material.</p>

Question	Answer	Mark	Guidance
	<ul style="list-style-type: none"> • Pattern plate covered in phenolic resin bonded sand • Heated pattern plate hardens sand 'shell' • Shell halves clamped/bolted together • Details of mould features to be shown/given. • Fill shell mould with molten metal and leave to cool. • Remove casting from mould. • QC – check casting is complete and sound. <p>**Allow credit for suitable description of injection moulding if plastics material used. Details of mould required. No surface finishing needed.</p> <ul style="list-style-type: none"> • Back plate positioned in machining fixture • CNC machining centre used to drill and tap four M6 holes • QC – check accuracy of threaded holes • Clean bare casting for surface finishing. • Apply surface finish - paint; powder coating; anodizing; lacquer 	<p>9</p>	

Question	Answer	Mark	Guidance
(f)	<p>Issues could be:</p> <ul style="list-style-type: none"> • Consumer rights protection, • Defective goods Safety /functional issues • Cost implications • Length of time dealing with issues/courts/citizen advice • Product labelling <p>examples</p> <ul style="list-style-type: none"> • Trade Descriptions Act 1968 • Sale of Goods Act 1979 • Appropriate reference to BSI/CE approval • Warranties • Age specific labelling • Allergen information • Specific product / company examples 	8	<p>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</p> <p>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</p> <p>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. Award credit where possible if response links to legislation.</p>
Q5 Total Marks 36			

Question		Answer	Mark	Guidance
6	(a)	<ul style="list-style-type: none"> The support must have a relatively smooth base to avoid scratch damage to the desk. The support must be stable and not topple over when the lamp is attached and adjusted. The adjusting/tightening system should be easy to undo and tighten up for all users. The lamp must be able to be held at a set angle so the user can direct the light where needed The lamp must not get too hot to prevent burns to users Electrical safety must be ensured to prevent potential shock hazard to users The design should be contemporary and should blend with popular aesthetic designs in current fashion 	4	<p>Clear statement and justification required for a mark</p> <p>Must be related to the product – no marks for generic responses</p> <p>Must be a full response – - no marks for identification only.</p> <p>Four justified design requirements.</p> <p>Give one mark if two valid points given but not fully justified.</p>
	(b)	<p>Ergonomics considered in:</p> <ul style="list-style-type: none"> Anthropometric data (thumb/finger) on tightening screw Pressure required to tighten the screw Texture of screw Easy to grip to transport and move - Simplicity of operations for user Visual impact on the user Position and size of switch 	4	<p>brief description 1 mark detailed description 2 mark</p> <p>Two ergonomic considerations clearly described</p>

Question		Answer	Mark	Guidance
	(c)	<p>Principles Software 'slices up' object into horizontal layers, sent in sequence to machine to build up 3D item</p> <p>methods :</p> <ul style="list-style-type: none"> • Laminated Object manufacturing -layers of adhesive coated materials • Stereo Lithography – traces shape onto bath of resin • 3D printing / Fused deposition modelling(FDM) • Selective Laser Sintering(SLS) 	4	<p>brief description of principles 1 mark detailed description of principles 2 marks</p> <p>Two methods described 1 x 2</p>
	(d)	<p>Features could be:</p> <ul style="list-style-type: none"> • Flexible system • Batches of a few items to several thousand • Reacts to market demand • Medium investment needed for a range of machinery that can be set up for different operations • Workforce often trained to operate more than one machine 	4	<p>Level 2 (3 - 4 marks)</p> <p>Detailed explanation, demonstrating clear understanding of batch production.</p> <p>Level 1 (0 – 2 marks)</p> <p>Brief description/statements of features of batch production, limited explanation</p>
	(e) (i)	<p>Material for Base</p> <ul style="list-style-type: none"> • Specified hardwood for laminating/steam bending • Aluminium alloy • Mild steel with appropriate finish • ABS • Polypropylene • HDPE • Acrylic <p>Properties or characteristics</p> <ul style="list-style-type: none"> • Available in sheet form; • rigid; • easy to press/form • accepts good finish. 	3	<p>award mark for other appropriate material not listed</p> <p>1x1 mark</p> <p>Award mark for other appropriate property/characteristic</p> <p>2x1 mark</p>

Question	Answer	Mark	Guidance
	<p>(ii) Base</p> <ul style="list-style-type: none"> • For all, consider, marking out/template/tessellation <p>Plastic Forming/heat</p> <ul style="list-style-type: none"> • Former created (perfect finish) must have detail of draft angles and extraction holes • Place in vacuum former • Plastic heated • Vacuum applied • Trim and finish • Could be two part press former • Secure, drill 15 mm, hole <p>Could be simple plug and yoke pressing</p> <p>Metal pressing</p> <ul style="list-style-type: none"> • Mould/press tool designed / created • Material cut to exact size • Accurate locate in press • Guards in place • Press • Check edges • Secure, drill 15 mm, hole <p>Wood laminating</p> <ul style="list-style-type: none"> • Cut veneers to size • Former created (could be multiple former) • Protective layer on former faces • Adhesive applied to faces of veneer • Accurately positioned in former • Clamps activated • Cure • Remove, secure, drill 15 mm, hole • Apply appropriate finish 	<p>9</p>	<p>Level 3 (5-6 marks) Process fully described, key features and technical details identified, Answer must include detail of specialist tooling for full marks.</p> <p>Level 2 (3-4 marks) Key stages presented, reasonably well described with key features identified</p> <p>Level 1 (0-2 marks) Some stages outlined (up to 2), very limited description</p> <p>Quality of description and communication</p> <p>Basic sketch or chart with limited annotation 1 mark</p> <p>Good sketch/chart with main features identified and labelled 2 marks</p> <p>Detailed sketch/chart with clear annotation 3 marks</p> <p>Max 1 if no sketch/chart used</p> <p>Award credit where possible if response doesn't link to chosen material.</p>

Question	Answer	Mark	Guidance
(f)	<p>Issues could be:</p> <ul style="list-style-type: none"> • Consumer rights protection, • Defective goods Safety /functional issues • Cost implications • Length of time dealing with issues/courts/citizen advice • Product labelling <p>examples</p> <ul style="list-style-type: none"> • Trade Descriptions Act 1968 • Sale of Goods Act 1979 • Appropriate reference to BSI/CE approval • Warranties • Age specific labelling • Allergen information • Specific product / company examples 	8	<p>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</p> <p>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</p> <p>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. Award credit where possible if response links to legislation.</p>
Q6 Total Mark 36			

Question		Answer	Mark	Guidance
7	(a)	<ul style="list-style-type: none"> The toaster should automatically switch off once the toast is ready, to conserve energy. The toaster should be stable so it does not easily topple over to avoid accidents. The toaster should be able to accommodate a wide range of toast sizes and thicknesses as various types of bread will be used. There should be a control to select how well-done the toast will be, as users' tastes vary. The toaster should toast rapidly to avoid the user having to wait too long. It should be possible to toast single slices to make the product versatile. The sides of the toaster should not get too hot to prevent burns to the user. The toaster should be easy to keep clean for hygiene reasons. The toaster should switch off if the toast starts to burn, to prevent fires. 	4	<p>Clear statement and justification required for a mark</p> <p>Must be related to the product – no marks for generic responses</p> <p>Must be a full response – - no marks for identification only.</p> <p>Four justified design requirements.</p> <p>Give one mark if two valid points given but not fully justified.</p>
	(b)	<p>Ergonomics considered in:</p> <ul style="list-style-type: none"> Visual clarity for understanding controls Insertion / extraction of toast Size of controls Texture of controls / grip Simplicity of operations for user 	4	<p>brief description 1 mark detailed description 2 mark</p> <p>Two ergonomic considerations clearly described</p>

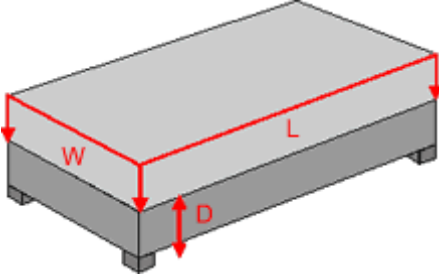
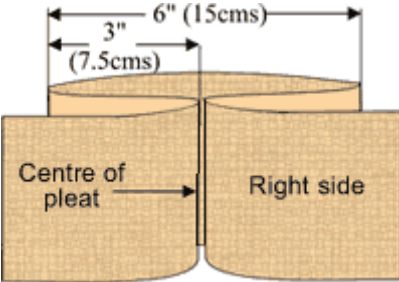
Question		Answer	Mark	Guidance
	(c)	<p>Principles Software 'slices up' object into horizontal layers, sent in sequence to machine to build up 3D item</p> <p>methods :</p> <ul style="list-style-type: none"> • Laminated Object manufacturing -layers of adhesive coated materials • Stereo Lithography – traces shape onto bath of resin • 3D printing / Fused deposition modelling(FDM) • Selective Laser Sintering(SLS) 	4	<p>brief description of principles 1 mark detailed description of principles 2 marks</p> <p>Two methods described 1 x 2</p>
	(d)	<p>Features could be:</p> <ul style="list-style-type: none"> • Flexible system • Batches of a few items to several thousand • Reacts to market demand • Medium investment needed for a range of machinery that can be set up for different operations • Workforce often trained to operate more than one machine 	4	<p>Level 2 (3 - 4 marks)</p> <p>Detailed explanation, demonstrating clear understanding of batch production.</p> <p>Level 1 (0 – 2 marks)</p> <p>Brief description/statements of features of batch production, limited explanation</p>
	(e) (i)	<p>A simple mechanism to show a viable method of pop-up. A clear indication of how the pop-up occurs in response to an electrical signal. e.g. A spring-loaded latch, which is released when a solenoid is energised. A spring that is held compressed by an energised electromagnet and released when the magnet turns off. A motor driving a rack and pinion.</p>	3	<p>Method of pop-up 1 mark Method of responding to an electrical signal 1 mark Principle of operation clear 1 mark</p>

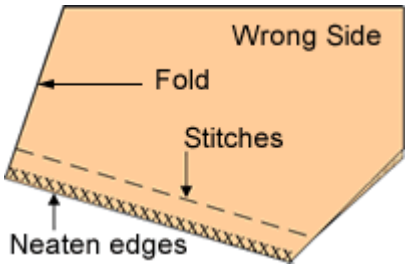
Question	Answer	Mark	Guidance
	<p>(ii) Candidates should produce a circuit diagram to provide a timing function. For full credit, it should be clear how an adjustable time period is achieved. The output should be clearly indicated.</p> <p>There are a number of different ways of achieving this. Expected answers might include <u>some</u> of the following features:</p> <ul style="list-style-type: none"> • 555 monostable circuit. • Variable resistor in place of R1 to adjust the time period. • 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. • Counter IC with a clock signal input. • Use of a transistor/MOSFET to buffer the output from the control circuit. • Use of a solenoid or relay on the output. 	9	<p>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.</p> <p>Level 2 (3-4 marks) Clear circuit diagram containing some relevant functional features. Candidate has attempted to describe operation of circuit.</p> <p>Level 1 (0-2 marks) Attempt at a circuit diagram with little relevance to the application. Circuit operation not described.</p> <p>Quality of description and communication</p> <p>Circuit diagram with some correct BSI symbols 1 mark</p> <p>Complete circuit diagram with mostly correct BSI symbols 2 marks</p> <p>Complete circuit diagram with correct BSI symbols and appropriate annotation (e.g. labelled power supply) 3 marks</p>

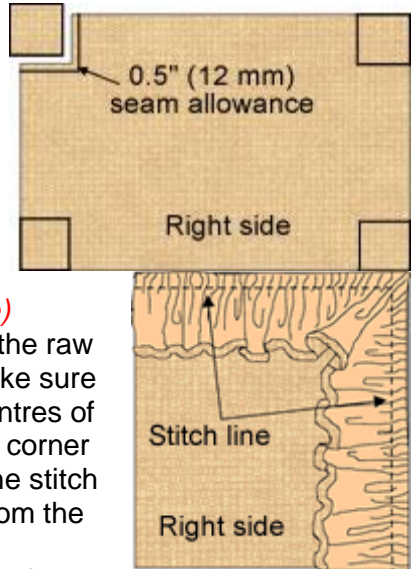
Question	Answer	Mark	Guidance
(f)	<p>Issues could be:</p> <ul style="list-style-type: none"> • Consumer rights protection, • Defective goods Safety /functional issues • Cost implications • Length of time dealing with issues/courts/citizen advice • Product labelling <p>examples</p> <ul style="list-style-type: none"> • Trade Descriptions Act 1968 • Sale of Goods Act 1979 • Appropriate reference to BSI/CE approval • Warranties • Age specific labelling • Allergen information • Specific product / company examples 	8	<p>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</p> <p>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</p> <p>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. Award credit where possible if response links to legislation.</p>
Q7 Total Mark			36

Question		Answer	Mark	Guidance
8	(a)	<ul style="list-style-type: none"> The fabric must be easy care because it has to be washed very regularly. The fabric used must be absorbent to maintain body temperatures. The size must be suitable to be available in a range of sizes, single, double and king size. The fabric must be comfortable against the skin to avoid irritation. The fabric must be hardwearing to withstand constant use and regular washing. 	4	<p>Clear statement and justification required for a mark</p> <p>Must be related to the product – no marks for generic responses</p> <p>Must be a full response – - no marks for identification only.</p> <p>Four justified design requirements.</p> <p>Give one mark if two valid points given but not fully justified.</p>
	(b)	<p>Ergonomics considered in:</p> <ul style="list-style-type: none"> Anthropometric data according to people/bed size Ease of fastening the duvet cover. Weight of the fabric for handling particularly when wet Method of securing the pillow inside the pillow case Height of bed from the floor for the valance Feel of material against the skin Look/style/aesthetic issues 	4	<p>brief description 1 mark detailed description 2 mark</p> <p>Two ergonomic considerations clearly described</p>
	(c)	<p>Principles Software 'slices up' object into horizontal layers, sent in sequence to machine to build up 3D item</p> <p>methods :</p> <ul style="list-style-type: none"> Laminated Object manufacturing -layers of adhesive coated materials Stereo Lithography – traces shape onto bath of resin 3D printing / Fused deposition modelling(FDM) Selective Laser Sintering(SLS) 	4	<p>brief description of principles 1 mark detailed description of principles 2 marks</p> <p>Two methods described 1 x 2</p>

Question		Answer	Mark	Guidance
	(d)	<p>Features could be:</p> <ul style="list-style-type: none"> • Flexible system • Batches of a few items to several thousand • Reacts to market demand • Medium investment needed for a range of machinery that can be set up for different operations • Workforce often trained to operate more than one machine 	4	<p>Level 2 (3 - 4 marks)</p> <p>Detailed explanation, demonstrating clear understanding of batch production.</p> <p>Level 1 (0 – 2 marks)</p> <p>Brief description/statements of features of batch production, limited explanation</p>
	(e) (i)	<p>Fabric for the bedding set:</p> <ul style="list-style-type: none"> • 50% polyester and 50% cotton fibres blended <p>Properties or characteristics The two fibres complement each other</p> <ul style="list-style-type: none"> • Polyester is easy care/ quick drying/crease resistant/easy to dye/hard wearing • Cotton is absorbent /soft to the touch /mercerised has improved lustre/strong when wet 	3	<p>award mark for other appropriate Fibre</p> <p>1x1 mark</p> <p>Award mark for other appropriate correct property/characteristic</p> <p>2x1 mark</p>

Question	Answer	Mark	Guidance
(ii)	<p>Pleated Valance Sheet with inverted pleats A valance is usually made from sheeting fabric so that it has no seams in the sheet section and can be easily laundered. It fits over the mattress and covers the sides of the bed down to the floor.</p> <p>Requirements:</p> <ul style="list-style-type: none"> • Sheeting fabric or suitable fabric. • Matching thread.  <p>Measuring for a Valance Sheet:</p> <ol style="list-style-type: none"> 1. Width of the bed(W): measure the width of the bed base. W = plus 1" (2.5 cms) for the seam allowances. 2. Length of the bed (L): measure the length of the bed base. L = plus 1.5" (3.75 cms) for the seam allowances and hem at bed head 3. Measure the drop of the valance (D): measure from the bottom of the mattress to the floor or the required drop and add 1.5" (3.75 cms) for the seam allowances and hem. For the inverted pleats at the bottom corners and regular intervals, add four times the length of the mattress to twice the width of the mattress, Widths of fabric may need to be joined together with a French seam to achieve this measurement. Match patterned fabrics where necessary.  <p>Preparing a Pleated Valance:</p> <ol style="list-style-type: none"> 1. Join all D pieces to form a continuous length 2. Turn up a double 0.5" (12 mm) hem at the lower edge and pin. 3. Turn in a double 0.5" (12 mm) hem at each side edge and pin. 4. Machine stitch around the hems on all the length and press. 		<p>Level 3 (5-6 marks) Process fully described, key features and technical details identified, Answer must include detail of specialist tooling for full marks.</p> <p>Level 2 (3-4 marks) Key stages presented, reasonably well described with key features identified</p> <p>Level 1 (0-2 marks) Some stages outlined (up to 2), very limited description</p> <p>Quality of description and communication</p> <p>Basic sketch or chart with limited annotation 1 mark</p> <p>Good sketch/chart with main features identified and labelled 2 marks</p> <p>Detailed sketch/chart with clear annotation 3 marks</p> <p>Max 1 if no sketch/chart used</p> <p>Award credit where possible if response doesn't link to chosen material.</p>

Question	Answer	Mark	Guidance
	<p>5. Mark out the two lengths and one width of the fabric mark with pins.</p> <p>6. Form pleats at regular intervals.</p> <p>7. Bring the 2 sides of each pleat together and flatten the excess fabric evenly at the back to form an inverted pleat. Tack in place along the top edge and press the pleats down their length making sure the folds are at right angles to the top edge. Also making sure that there is a pleat exactly at each corner</p> <p>Making a Valance Sheet: (this diagram does not need to four corners cut away</p> <ol style="list-style-type: none"> To fit the sheet section, turn in a double 0.5" (12 mm) hem at the top edge. Pin and stitch. <i>(Show this as pleats not gathers please)</i> With right sides together and matching the raw edges, pin the valance to the sheet. Make sure that the pleats are even and that the centres of the inverted pleats are lined up with the corner seams. Adjust the if necessary. Machine stitch the skirt to the sheet, 0.5" (12 mm) in from the raw edges. Neaten the raw edges by overlocking or zigzag stitch and press.  <ol style="list-style-type: none"> Neaten the raw edges of these seams by overlocking or zigzag stitch. 	<p>9</p>	



Question	Answer	Mark	Guidance
(f)	<p>Issues could be:</p> <ul style="list-style-type: none"> • Consumer rights protection, • Defective goods Safety /functional issues • Cost implications • Length of time dealing with issues/courts/citizen advice • Product labelling <p>examples</p> <ul style="list-style-type: none"> • Trade Descriptions Act 1968 • Sale of Goods Act 1979 • Appropriate reference to BSI/CE approval • Warranties • Age specific labelling • Allergen information • Specific product / company examples 	8	<p>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</p> <p>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</p> <p>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. Award credit where possible if response links to legislation.</p>
Q8Total Mark 36			

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