2011 Product Design

Intermediate 2

Finalised Marking Instructions

Product Design – Intermediate 2

Within each question, marks are not awarded for repetition. This excludes question 1, where repetition is not allowed with parts (a), (b) and (c)

SECTION A

Q1		Marks
(a) (i)	**Suitable material (polypropylene):** • Smooth/no splinters • Hygienic • Can be modified/formed into required shape/easy to shape, form, manufacture • One piece manufacture • Mould determines manufacture • Colour choice/in-build colour • Weatherproof/waterproof • Strong/hardwearing/robust/tough/sturdy • Durable/lasts a long time • Inexpensive/cheap • Safe (must be justified) • Easily cleaned • No need to paint • Maintenance free • Good strength to weight ratio • Ease of connecting/jointing • Etc. Relevant + true Candidates may refer to properties of the slide rather than properties of the material. This will also attract marks in this section. Where the candidate has given two contradicting reasons, these cancel each other out and the remainder of the candidate's response should be marked. Only the first 2 responses are marked. 1 mark per correct response up to total of 2 marks.	**(2)**

Q1		Marks
(a) (ii)	**Suitable material (steel):** **Two possible routes of reasoning within this answer. Consumer and manufacturer suitability.** • Light in weight • Good strength to weight ratio • Strong in every direction/not easy to bend **(for consumer)** • Strong/hardwearing/robust/tough/sturdy • Easily formed (jigs/formers/etc)/easy to bend **(for manufacturer)** • Inexpensive/cheap • Ease of construction/connecting/jointing/assembly • Can be painted/easy to coat/easy to finish • Readily available • Etc. Where the candidate has given two contradicting reasons, these cancel each other out and the remainder of the candidate's response should be marked. Only first 2 responses are marked. 1 mark per correct response up to total of 2 marks.	**(2)**

Q1		Marks
(a) (iii)	**Finish and reason** **Finish and reason must match** **Finishes** • Powder coating/dip coating/plastic coating • Electro-painting • Electro-plating • Galvanizing • Sheradising • Spray painting/gloss paint/enamel paint/lacquer • Etc • **<u>Paint scores no marks</u>** **Reasons** • Protect it • Protection from rust/weather/water/wear/ground/etc • Hygiene reasons • Easily cleaned • Durability reasons • Ease of manufacturing reasons • Safety reasons • Psychological reasons • Aesthetic reasons/looks good • Etc. Only the first response is marked. 1 mark for correct finish and 1 mark for matching reason, up to total of 2 marks.	**(2)**

Q1		Marks
(a) (iv)	**Fixing steel supports and reason** **Fixing and reason must match** **Fixing** • Bolted together/nuts and bolts • Machine screws / stainless steel, brass machine screws • Knock down fittings • Standard components • "Screws" is vague and scores zero • Etc **Reason** • Easy to assemble/dis-assemble • Non permanent construction • Cheap • Strong/secure • Easy to replace component parts • Material reasons • No specialist tools required • Etc Only the first response is marked. 1 mark for correct fixing and 1 mark for marching reason up to total of 2 marks.	**(2)**

Q1		Marks
(b) (i)	**"Anthropometrics"** Eg The slide width has been designed to suit child hip breadth (answer showing link between toy part and human dimension). • Width/length of treads – body/foot/leg width • Diameter of ladder frame – grip diameter • Vertical distance between treads – leg stretch • Height of handrail – arm reach/stretch • Width of ladder frame – body width Any suitable answer relating human dimensions and relevant aspect of the activity toy should be awarded 1 mark. 1 mark per correct response (including both elements of information) up to total of 2 marks. Vague answers which display an appropriate level of knowledge attract one mark. Two marks should be awarded where candidates have given an extended answer, which links one part of the activity toy to three or more bits of anthropometric data. eg The width of the slide has been designed to fit the 95th percentile child hip breadth (age given) so that almost all potential users can slide down without getting stuck. (Percentile/user/body dimension/activity toy part).	**(2)**
(ii)	**"Physiology"** Eg The activity toy has been designed to be moved easily by an adult around the garden. • Strength of components – relevant activity/standing/sliding/ gripping • Tread spacing – leg raise, climbing • The activity toy – moving lifting, dragging, shifting • Nuts/bolts – tightening during construction Any suitable answer relating to human limitations, linking to part of the activity toy. The use of physical action verbs linking to the use of the activity toy are to be looked for here. 1 mark per correct response (including both elements of information) up to total of 2 marks. Vague answers which display an appropriate level of knowledge attract one mark. Two marks should be awarded where candidates have given an extended answer, which links one part of the activity toy to three, or more **justified** physiological activities. Eg The bolts have been designed to be easily tightened during assembly using a small amount of effort and physical strength.	**(2)**

Q1		Marks
(iii)	**"Psychology"** Eg The choice of bright/warm/advancing coloured material on the slide will ensure that the user knows which part is the fun part. • Bright colours - fun • Coloured identification of parts – user friendliness • Robust appearance - feeling of safety (for child/parent/carer)/ stability • Curvy appearance – safety/fun/exciting • Bumpy appearance – fun/exciting • Steep ladder/excessive height – danger/excitement • High handrail – safety/security • Etc Any suitable answer relating to human thoughts/feelings/emotions, linking to part or bit of the activity toy. 1 mark per correct response (including both elements of information) up to total of 2 marks. Vague answers which display an appropriate level of knowledge attract one mark. Two marks should be awarded where candidates have given an expanded answer, which links one part of the activity toy to three, or more **justified** psychological feelings. Eg The bright colour for the slide has been chosen to ensure the user can see which part of the toy looks like the most fun bit. This is very useful to users because they will want to get onto the fun bit as quickly as possible.	

Q1		Marks
(c) (i)	**"safety"** • Complete toy – securely assembled • Smooth surface/edges – no cuts or torn clothes • Horizontal bar at base of ladder – stability/will not tip over • Handrail – child will not fall off • Shallow angle of slide – child does not go too fast • Steel supports – activity toy does not break • Raised slide sides – contains child within slide • Textured treads – non slip when climbing • Whole slide – passed BSI testing • Bottom rail end caps – not sharp • Surface finishes – non toxic • Etc. Any suitable justification relating to safety, linking to part of the activity toy. Vague answers which display an appropriate level of knowledge attract 1 mark. 1 mark per correct response (including both elements of information) up to total of 2 marks.	**(2)**
(ii)	**"durability"** • Any material properties linked to durability • Steel – will not bend or break • Coating on tubular steel frame – will resist moisture / prevent rusting • Polypropylene slide – does not degrade over time / weatherproof • Etc. Any suitable answer relating to durability, linking to part of the activity toy. Vague answers which display an appropriate level of knowledge attract 1 mark. 1 mark per correct response (including both elements of information) up to total of 2 marks.	

Q1		Marks
(iii)	**"contrast"** • Different components – contrasting colours • Different components – contrasting materials • Different components – contrasting manufacturing methods • Different components – contrasting shape/form/straight - curvy • Different components – contrasting textures (slip/grip) • Different textured parts – contrasting function (slip/grip) • Different components – contrasting structures (skeletal/solid) • Whole activity toy/slide – contrast with its environment Any suitable justification relating to contrast, linking to part of the activity toy. Vague answers which display an appropriate level of knowledge attract 1 mark. 1 mark per correct response (including both elements of information) up to total of 2 marks. **Note: The marking scheme for question 1 (b) and (c) is as follows** **One part + one justification = one mark** **One part + two justifications = one mark** **One part + three justifications = two marks** **Two separate parts + two separate justifications = two marks** **Vague, incomplete/extended responses may attract one mark**	**(2)** **20**

Q2			Marks
(a)	**(i)**	Duralumin, Silumin, blackbar bronze, nitinol, cast iron, Muntz metal, mild steel/stainless steel etc. Steel on its own scores zero. Any alloy is acceptable regardless of its presence in the arrangements document **1 mark per correct response up to a total of 2 marks**	
	(ii)	Conformity to European electrical standards/reached safety standards/tested for safety/show the user it is safe/it is safe/like a kitemark/approved. **1 mark for correct response.**	
(b)	**(i)**	• Can be used immediately • Portability • Can be used where no other power source is available • No trailing cables • Eliminates tripping hazards • Less risk of electrocution • Not affected by power cut • Many tools can all use same battery • Etc. **1 mark per correct response up to total of 2 marks.**	
	(ii)	• Tools tend to be more powerful • No need to change battery • No need to charge battery • No chance of battery failure • Can be used immediately/instantly • Less chance of jobs being held up due to recharging time • No battery disposal (environment) • Cheaper to run than battery powered equivalent • Etc. **1 mark per correct response up to total of 2 marks**	**(7)**

Q3		Marks
This question could be answered in a variety of ways. An aspect could be a part of the toothbrush or a typical design 'issue' (eg safety, durability, aesthetics etc) A description of each evaluative method will attract marks when appropriately linked to an aspect. Qualitative and/or quantitative data may result from evaluation. *No marks are awarded for stating aspects.* *Generic descriptions of methods of evaluation may attract 2 marks.* **(a)** User trial: ease of use/functionality/etc. **Description marked on a 2-1-0 scale.** **(b)** Test rig: on/off switch/charger time/motor life/brush life/etc. **Description marked on a 2-1-0 scale.** **(c)** Survey: aesthetics/comfort/ease of use/perceived value for money/opinions on ease of cleaning/etc. **Description marked on a 2-1-0 scale.**		**(6)**

Q4			Marks
(a)	**(i)**	As the plastic softens and stretches the plastic thins as it stretches over the mould/pattern/because it stretches.	
	(ii)	The pattern or mould has fillets/to prevent tearing/harder to break/ stronger/shape of the mould.	
	(iii)	It allows the product to be easily removed/separated/from the mould/ pattern.	
		1 mark per correct response up to total of 3 marks.	
(b)		**Responses may include statements such as:** Thermoplastics have a plastic memory, Thermoplastics get soft when heated, Thermosets get hard when heated, Thermosets are heat resistant, Thermoplastics can be softened and reshaped, thermosets cannot Thermoplastics are chain linked polymers, thermosets are cross linked polymers Thermosets are a mixture of a catalyst and resin, this causes an exothermic reaction thus hardening Suitable processes linking to group of plastic Candidates must include both types of plastic in their response to get 2 marks. **Description marked on a 2-1-0 scale, 1 mark per correct difference.**	**(5)**

Q5		Marks
(a)	A. (card model) early/ideas/idea generation/etc B. (styrofoam block model) presentation/end of process/developed idea/etc C. (rapid prototype) development / synthesis/functionality and 3D visual testing/prior to manufacture/etc D. (CAD) Early to pre-final/stage presentation/end of process/etc *Candidates may list the models in a logical order. In this case the order is ABC with D occurring at any stage. CAD modelling could happen at any stage. This attracts 1 mark.* **1 mark per correct naming of stage up to total of 4 marks.**	
(b)	A. Cheap/quick/3-D view/exploratory/etc B. Some detail/no special tooling/fairly quick/good visual representation/ dimensions (scaled)/proportion/etc C. Lots of detail/looks and feels like the real thing/testing/altering/presenting, etc D. Easy to change/manipulate/store/show different finishes/materials/ different viewpoints/for presentation etc. *Advantages must match type of model listed on the question paper* *OR* *be appropriate to the candidate's response in part (a)* *Marks will not be awarded for repetition* **1 mark per correct advantage up to total of 4 marks.**	**(8)**

Q6		Marks
	Ergonomics: Any relevant and true anthropometric, psychological or physiological explanation. **Safety:** sharpness/bluntness/build quality/hygiene/weight/etc. **Aesthetics:** shape/size/form/contrast/colour/encourage usage/etc. **Materials:** Comfortable/tactile/attractive or in-built colour/hygiene/safety/ ease of cleaning/lightweight/non- allergenic/etc. *We are looking for aspects of the cutlery to be linked to each design issue to get 1 mark per issue.* **1 mark per correct response up to total of 4 marks.**	**(4)**

[END OF MARKING INSTRUCTIONS]