

# **Markscheme**

**November 2016**

**Design technology**

**Higher level and standard level**

**Paper 2**

14 pages

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### General Marking Instructions

1. Follow the markscheme provided, award only whole marks and mark only in **RED**.
2. Make sure that the question you are about to mark is highlighted in the mark panel on the right-hand side of the screen.
3. Where a mark is awarded, a tick/check (✓) **must** be placed in the text at the **precise point** where it becomes clear that the candidate deserves the mark. **One tick to be shown for each mark awarded.**
4. Sometimes, careful consideration is required to decide whether or not to award a mark. In these cases use RM™ Assessor annotations to support your decision. You are encouraged to write comments where it helps clarity, especially for re-marking purposes. Use a text box for these additional comments. It should be remembered that the script may be returned to the candidate.
5. Personal codes/notations are unacceptable.
6. Where an answer to a part question is worth no marks but the candidate has attempted the part question, use the “ZERO” annotation to award zero marks. Where a candidate has not attempted the part question, use the “SEEN” annotation to show you have looked at the question. RM™ Assessor will apply “NR” once you click complete.
7. If a candidate has attempted more than the required number of questions within a paper or section of a paper, mark all the answers. Scoris™ will only award the highest mark or marks in line with the rubric.
8. Ensure that you have viewed **every** page including any additional sheets. Please ensure that you stamp “SEEN” on any additional pages that are blank or where the candidate has crossed out his/her work.
9. Mark positively. Give candidates credit for what they have achieved and for what they have got correct, rather than penalizing them for what they have got wrong. However, a mark should not be awarded where there is contradiction within an answer. Make a comment to this effect using a text box or the “CON” stamp.

## General Marking Instructions

### Subject Details: Design technology HL and SL Paper 2 Markscheme

#### Mark Allocation

Candidates are required to answer **ALL** questions in Section A (total **[30 marks]**) ONE question in Section B **[20 marks]**. Maximum total = **[50 marks]**.

#### Markscheme format example:

Question			Answers	Notes	Total
4.	b	ii	the displacement and acceleration ✓ are in opposite directions ✓	Accept <i>force</i> for <i>acceleration</i> .	2

- Each row in the “Question” column relates to the smallest subpart of the question.
- The maximum mark for each question subpart is indicated in the “Total” column.
- Each marking point in the “Answers” column is shown by means of a tick (✓) at the end of the marking point.
- A question subpart may have more marking points than the total allows. This will be indicated by “**max**” written after the mark in the “Total” column. The related rubric, if necessary, will be outlined in the “Notes” column.
- An alternative wording is indicated in the “Answers” column by a slash (/). Either wording can be accepted.
- An alternative answer is indicated in the “Answers” column by “**OR**” on the line between the alternatives. Either answer can be accepted.
- Words in angled brackets < > in the “Answers” column are not necessary to gain the mark.
- Words that are underlined are essential for the mark.
- The order of marking points does not have to be as in the “Answers” column, unless stated otherwise in the “Notes” column.
- If the candidate’s answer has the same “meaning” or can be clearly interpreted as being of equivalent significance, detail and validity as that in the “Answers” column then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by **OWTTE** (or words to that effect).
- Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
- Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking, indicate this by adding **ECF** (error carried forward) on the script. “ECF acceptable” will be displayed in the “Notes” column.
- Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the “Notes” column.

### Section A

Question			Answers	Notes	Total
1	a	i	Fastening/nuts and bolts ✓ Welding ✓ Brazing ✓	<i>Award [1] for stating a joining technique which would have been used for the steel frame.</i>	[1 max]
		ii	will not shatter into sharp/small pieces when damaged✓ avoiding any danger/injury to user✓  can withstand impact caused by heavy weights placed on the table/everyday activities✓ without easily breaking;✓	<i>Award [1] for identifying a reason why safety glass is used for the computer desk and [1] for a brief explanation.</i>	[2 max]
	b	i	cost effective ✓ easy to cut / cheap to distribute ✓  lightweight ✓ easy to handle / transport around the production plant ✓	<i>Award [1] for identifying an advantage of the use of tubular metal to the manufacturer and [1] for a brief explanation.</i>	[2 max]
		ii	less sturdy/not as stable under load✓ parts may flex/bend✓  depending on thickness/gauge of tube✓ weight could make it difficult to transport/assemble✓	<i>Award [1] for identifying a disadvantage of the use of tubular metal to the consumer and [1] for a brief explanation.</i>	[2 max]
	c	i	user may be tempted to lean on it while looking at the screen✓ the user could injure themselves as it collapses/damage the sliding mechanism✓	<i>Award [1] for identifying a potential safety issue for the keyboard shelf of the computer desk table and [1] for a brief explanation.</i>	2

		<p><b>ii</b></p> <p>glass can scratch easily✓ which can damage surface /appearance✓ if abrasive/chemical cleaning equipment is used✓</p> <p>glass tends to mark easily with fingerprints, grease, and liquids✓ needs regular cleaning✓ to maintain good appearance;</p> <p>glass will have to be replaced if broken✓ and cut to specific size/shape to fit the table✓ which will be costly/inconvenient for the consumer✓</p>	<p><i>Award [1] for each of three distinct points in an explanation of one maintenance issue for consumers of the use of glass for the work surface of the computer desk.</i></p>	<p><b>[3 max]</b></p>
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	<b>d</b>	<b>i</b>	95 <sup>th</sup> – 5 <sup>th</sup> percentile/490mm – 355mm✓  = 135mm✓	<i>Award [1] for the workings and [1] for the correct answer. Units must be stated and included in final answer.</i>	<b>2</b>
		<b>ii</b>	more accurate/useful✓ user is usually in a fixed position when seated at a desk✓  easier/quicker to collect✓ user remains still while measurements are taken✓  more cost effective to gather✓ does not require specialist equipment✓	<i>Award [1] for identifying why static physical data measurements are used to collect the anthropometric data for the computer desk and [1] for a brief explanation.</i>	<b>[2 max]</b>
	<b>e</b>	<b>i</b>	qualitative data measures user satisfaction relating to the comfort of the chair✓ providing user's opinion about levels of comfort/discomfort✓  nominal scale/rank order can be created✓ based on user's opinion on comfort (e.g. on a scale from 1 to 5 ranging from very comfortable to very uncomfortable)✓	<i>Award [1] for identifying one reason why an ordinal scale is used to collect data about the comfort of the chair and [1] for a brief explanation.</i>	<b>[2 max]</b>
		<b>ii</b>	reach✓ required to access the handle/lever easily✓  grip/muscle strength ( <i>accept <u>strength</u> if reference to body part including arm, wrist, hand, finger is included</i> ) ✓ force required to push/pull the lever to adjust the height of the chair✓	<i>Award [1] for identifying one biomechanical factor important in the design of the adjustable mechanism on the chair and [1] for a brief explanation.</i>	<b>[2 max]</b>

2	a	<p>image✓ dominant design✓ iconic✓ recognisable✓ timeless✓ omnipresent✓</p>	<p><i>Award [1] for each of two factors that would make the Swiss Army knife be considered as a design classic from the list. [2 max]</i></p>	<p><b>[2 max]</b></p>
	b	<p>the various models of each knife have specific functions✓ meaning that the form of the Swiss Army Knife dictates its purpose✓</p> <p>the function of each miniature tool is designed first✓ the form of the knife is designed around the size of the tools✓</p> <p>the shape/form of the knife is restrained/simple✓ but primarily designed to accommodate a complex set of tools discretely within it✓</p>	<p><i>Award [1] for identifying how form follows function in the case of a Swiss Army knife and [1] for a brief explanation.</i></p>	<p><b>[2 max]</b></p>
3		<p>by dividing the market into smaller segments✓ designers can easily identify the needs of a specific group of people✓ and vary the design of the Swiss Army Knife accordingly✓</p>	<p><i>Award [1] for each of three distinct points in an explanation of how the Swiss Army knife designers have used market segments to increase the sales of the Swiss Army knife.</i></p>	<p><b>3</b></p>
4		<p>improves product efficiency✓ this makes it easy to recycle/recover materials✓ promotes sustainability/circular economy✓</p> <p>reduction in the use of materials✓ without compromising the performance of the product✓ whilst decreasing the use of resources/impact on the environment✓</p> <p>reduces the use of energy throughout the lifecycle of a product✓ making it cost effective for the manufacturer✓ and affordable for the consumer✓</p>	<p><i>Award [1] for each of three distinct points in an explanation of how the principle of dematerialization has been beneficial to the Swiss Army knife.</i></p>	<p><b>[3 max]</b></p>



### Section B

Question		Answers	Notes	Total
5	a	tensile strength✓ compressive strength✓ stiffness✓ hardness✓ toughness✓ durable✓	<i>Award [1] for each of two mechanical properties of rubber wood, which would make it suitable to be used in the dollhouse toy from the list. [2 max]</i>	[2 max]
	b	local production helps sustain/develop the community around the factory✓ reduces the quantity of rubber wood required to be imported✓ which decreases the emissions whilst transporting to the factory✓  sustainable/reforestation programmes✓ supply of rubber wood can be managed✓ which can aid planning for manufacture✓	<i>Award [1] for each of three distinct points in an explanation of how Plan Toy can promote good environmental practices in relation to the production of the rubber wood it uses as a raw material for the dollhouse</i>	[3 max]
	c	assembly line production is more efficient than the current method✓ increases the volume of goods produced✓ reducing production costs/time✓  assembly line production ensures consistent product quality✓ which promotes the company/product reputation✓ this can generate more profits/revenue/increase sales✓  use of an assembly line production can be easily varied✓ enabling the company to extend the its product range✓ which can provide consumers with a greater choice✓	<i>Award [1] for each of six distinct points in a discussion of whether Plan Toys should introduce assembly line production for the production of the dollhouse.</i>  <i>[3 max] for each separate and distinct discussion</i>	[6 max]

Continued .....

		<p>assembly line production will require fewer employees✓ leading to higher unemployment in Trang✓ leading to negative social effects✓</p> <p>assembly line production may require significant investment✓ which may not be economically viable✓ which could lead to the factory closing✓</p> <p>assembly line production may lead to deskilling of employees✓ leading to reduced job satisfaction✓ resulting in some leaving the job/moving to cities such as Bangkok for skilled employment✓</p>		
	<b>d</b>	<p>consumer pressure✓ demand for toys made in an environmentally friendly/sustainable way✓ using methods of production that have reduced negative effect on employees and the environment✓</p> <p>legislation✓ incentives and penalties can be applied by governments✓ to ensure manufacturers operate factories in an eco-friendly way✓</p> <p>environmental considerations✓ commitment to sustainable forestry practices✓ to promote ecological balance/corporate social responsibility✓</p>	<p><i>Award [1] for each of three distinct points in an explanation of three drivers for green design that would lead to Plan Toys developing an environmentally friendly factory.</i></p> <p><i>Award [1] for identifying each driver for green design and [2] marks in an explanation of each identified driver.</i></p> <p><i>[3 max] for each separate and distinct explanation.</i></p>	<b>9</b>

Question		Answers	Notes	Total
6	a	<p>evolution in the use of cameras used for taking selfies✓ provided a market opportunity for the introduction of the selfie stick✓</p> <p>new idea is needed as a result of a need/problem in the marketplace✓ because consumers realised using a smartphone alone would not provide the results expected✓</p>	<p><i>Award [1] for identifying why the innovation of the selfie stick may be seen as an example of market pull and [1] for a brief explanation.</i></p>	[2 max]
	b	<p>the handle allows the user to grip the stick firmly✓ which makes it more comfortable to hold✓ and may be more efficient biomechanically/reduce fatigue✓</p> <p>rubber is easier to grip✓ and is not slippery✓ making it less likely to be dropped in different weather conditions/situations (e.g. with moist hands)✓</p> <p>works for different hand sizes✓ which means that a standard size can be used for a wide range of hand sizes✓ which allows them to be mass produced / benefit from economies of scale✓</p>	<p><i>Award [1] for each of three distinct points in an explanation of one benefit relating to human factors of designing the selfie stick handle with a soft rubber finish.</i></p>	[3 max]
	c	<p>portability/weight✓ compact and made with lightweight materials✓ it is small/light weight enough to be carried with one hand/transported in a small bag✓</p> <p>durability/ease of maintenance✓ the telescopic arm is less likely to require continuous maintenance✓ parts are made of material with high resistance to wearing or chemical attack and abrasion✓</p> <p>easy to use/intuitive design✓ easy to attach and release smartphone✓ regardless of its size/shape✓</p>	<p><i>Award [1] for each of three distinct points in an explanation of <b>two</b> important design criteria for the selfie stick.</i></p> <p><i>[3 max] for each separate and distinct explanation</i></p>	[6 max]

Continued ....

		<p>holds the smartphone safely✓  provides an effective mechanism to hold smartphone✓  the telescopic arm should extend to a comfortable length to support the weight of the phone✓</p> <p>cost✓  uses standard/less materials✓  mass produced✓</p> <p>adjustability✓  telescopic arm can be manipulated✓  to provide close up or wide angle selfies/depending on the number of people in the photo✓</p>		
	d	<p><b>Growth stage</b>  the market has accepted the selfie stick✓  which increased the demand/sales of the selfie stick✓  leading to increased R&amp;D opportunities✓</p> <p><b>Planned obsolescence</b>  designers may limit the effective lifespan of the selfie stick✓  so that users can demand/expect new versions of the product✓  increasing revenue✓</p> <p><b>Further development</b>  designers may incorporate new technologies to the next generation of selfie sticks✓  which may satisfy the need/demand for new features✓  which keeps the product competitive in the market✓</p>	<p><i>Award [1] for each of three distinct points in an explanation of the product life cycle of the selfie stick in relation to its growth, planned obsolescence and its potential for further development as an innovation. [3 max] for each separate and distinct explanation</i></p> <p><i>No mark should be awarded for simply re-stating or defining the meaning of the three stages.</i></p>	9

Question		Answers	Notes	Total
7	a	<p>the nozzle can reach high temperatures during use✓  thermoset plastics are heat resistant/will not change shape as a result of being in contact with boiling water✓</p>	<p><i>Award [1] for identifying why a thermosetting plastic material is required for the nozzle of the Nespresso Pixie coffee machine and [1] for a brief explanation</i></p>	2
	b	<p>product/raw material recovery✓  aluminium can be recycled easily✓  which reduces the amount of materials disposed of in landfill✓</p> <p>minimise the need for new raw materials✓  reduction in energy used for extraction/pre-production✓  can have a positive environmental impact✓</p>	<p><i>Award [1] for each of three distinct points in an explanation of how the materials of the side panels contribute to reducing the environmental impact of the Nespresso Pixie at the disposal stage of its life cycle.</i></p>	[3 max]
	c	<p>a patent is a set of exclusive rights for a certain number of years✓  this prevents competitors from gaining information about the product✓  and developing similar products without the costs involved in R&amp;D✓</p> <p>there may be disputes over ownership✓  for who has the right to market the invention✓  leading to delays in obtaining the patent/releasing the product to market✓</p> <p>competitors may be able to understand the nature of the product by simply disassembling it✓  giving them sufficient information about developing similar products✓  that can be done more time and cost effectively✓</p>	<p><i>Award [1] for each of three distinct points in a discussion of why a product such as the Nespresso Pixie may or may not be protected by a patent.</i></p> <p><i>[3 max] for each separate and distinct discussion</i></p>	[6 max]

	<b>d</b>	<p>accuracy/consistency✓  high precision machining/close tolerance machining✓  provides good surface finishing✓</p> <p>low operating cost✓  cutting blades and tools will wear more slowly✓  reducing the need for replacement/low energy consumption✓</p> <p>flexible rates of production (low, medium to high volume batches/high rate production) ✓  meaning one operator can supervise many CNC machines✓  leading to reduced labour costs✓</p> <p>CNC machines can operate 24/7✓  with minimum human intervention/maintenance or using less skilled/trained operators✓  CNC machines are much safer than manually operated machines✓</p>	<p><i>Award [1] for each of three distinct points in an explanation of why CNC is an appropriate technique for manufacturing the aluminium sides of the Nespresso Pixie coffee machine.</i></p>	<p><b>[9 max]</b></p>
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