

# Markscheme

May 2025

Design technology

Higher / Standard level

Paper 2

© International Baccalaureate Organization 2025

All rights reserved. No part of this product may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without the prior written permission from the IB. Additionally, the license tied with this product prohibits use of any selected files or extracts from this product. Use by third parties, including but not limited to publishers, private teachers, tutoring or study services, preparatory schools, vendors operating curriculum mapping services or teacher resource digital platforms and app developers, whether fee-covered or not, is prohibited and is a criminal offense.

More information on how to request written permission in the form of a license can be obtained from <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

© Organisation du Baccalauréat International 2025

Tous droits réservés. Aucune partie de ce produit ne peut être reproduite sous quelque forme ni par quelque moyen que ce soit, électronique ou mécanique, y compris des systèmes de stockage et de récupération d'informations, sans l'autorisation écrite préalable de l'IB. De plus, la licence associée à ce produit interdit toute utilisation de tout fichier ou extrait sélectionné dans ce produit. L'utilisation par des tiers, y compris, sans toutefois s'y limiter, des éditeurs, des professeurs particuliers, des services de tutorat ou d'aide aux études, des établissements de préparation à l'enseignement supérieur, des fournisseurs de services de planification des programmes d'études, des gestionnaires de plateformes pédagogiques en ligne, et des développeurs d'applications, moyennant paiement ou non, est interdite et constitue une infraction pénale.

Pour plus d'informations sur la procédure à suivre pour obtenir une autorisation écrite sous la forme d'une licence, rendez-vous à l'adresse <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

© Organización del Bachillerato Internacional, 2025

Todos los derechos reservados. No se podrá reproducir ninguna parte de este producto de ninguna forma ni por ningún medio electrónico o mecánico, incluidos los sistemas de almacenamiento y recuperación de información, sin la previa autorización por escrito del IB. Además, la licencia vinculada a este producto prohíbe el uso de todo archivo o fragmento seleccionado de este producto. El uso por parte de terceros —lo que incluye, a título enunciativo, editoriales, profesores particulares, servicios de apoyo académico o ayuda para el estudio, colegios preparatorios, desarrolladores de aplicaciones y entidades que presten servicios de planificación curricular u ofrezcan recursos para docentes mediante plataformas digitales—, ya sea incluido en tasas o no, está prohibido y constituye un delito.

En este enlace encontrará más información sobre cómo solicitar una autorización por escrito en forma de licencia: <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

## 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 semi colon 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 required 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	Thermoplastic/thermosoftening plastic;	<i>Award [1] for the correct term Thermoplastic/thermosoftening plastic only [1 max]</i>	1
1.	a	ii	personalisable – developed brand loyalty/sentimentality/nostalgia;  Holding iconic status;	<i>Award [1] for each reason why culture is an important classic design characteristic of Nokia cell (mobile) phone products up to [2 max].</i>	2

*Question 1 continued*

Question			Answers	Notes	Total
1.	b	i	efficiency/speed of production; functions 24/7 leading to higher production/no need for breaks; reduces labour costs; high accuracy/consistency of work; reduced errors and waste; higher quality/finish of final product; can perform repetitive and dangerous tasks; can work in confined spaces; provides a long-term return on investment after initial setup costs; flexible/versatile in being able to change tooling;	<i>Award [1] mark per each advantage of using robotic systems in production [2 max].</i>	2
1.	b	ii	continuous flow/mass production; the production of large amounts of standardized products on production lines;	<i>Award [1] for identifying the scale of production.</i> <i>Award [1] for an outline of what mass or continuous/flow production is. [2 max].</i>	2

Question 1 continued

Question			Answers	Notes	Total
1.	c	i	<p>Stereolithography (SLA); a 3D model formed layer-by-layer by hardening molecules of a liquid polymer using a laser beam;</p> <p>selective laser sintering (SLS); a 3D model using a laser to fuse small particles of material into a mass</p> <p>fused deposition modelling (FDM); a 3D model that places melted layers of material on a bed to build up a 3D model;</p>	<p><i>Award [1] for each rapid prototyping technique that could be used to develop a complex Nokia cell (mobile) with high accuracy up to [2 max].</i></p> <p><b>Do not award marks across clusters</b></p>	2
1.	c	ii	<p>Different segments such as consumers who appreciate retro-styled products;</p> <p>Consumers who want a phone with basic features;</p> <p>Parents who want a phone for their child which reduces risks from social media;</p>	<p><i>Award [1] for one for how Nokia uses market segments.</i></p> <p><i>Award [1] for how Nokia establishes the target market.</i></p> <p><i>Award [1] for how Nokia uses various products to achieve this.</i></p> <p><b>[3 max].</b></p>	3

Question 1 continued

Question			Answers	Notes	Total
1.	d	i	Nokia 2024, the latest design uses Trade Mark (™) to distinguish from the classic Nokia.	<i>Award [1] for the type of intellectual property has been applied to the Nokia cell (mobile) phone designs [1 max].</i>	1
1.	d	ii	Nokia has a stable demand;  with a consistent customer base of adults of all ages and teenagers who are sentimental or fond of the handsets and appreciate the practicality of the design/simple/accessible function;  focusing/maintaining/regaining market share/maximizing profits by expanding their customer base/introducing/developing new improved versions of their product ranges;	<i>Award [1] for each reason why Nokia cell (mobile) phones are considered in the maturity phase of the product life cycle. [2 max].</i>	2

Question 1 continued

Question			Answers	Notes	Total
1.	e	i	<p>in order to meet demand/speed/efficiency of manufacture;</p> <p>change in technology/accuracy/smart material development) rising or falling production costs;</p>	<p><i>Award [1] for each process innovation that forces companies such as Nokia to develop cell (mobile) phone handsets to continuously improve the method of manufacturing up to [2 max].</i></p>	2
1.	e	ii	<p>the Nokia range/products could be perceived as not complicated/difficult to use (for some consumers);</p> <p>should provide on-going experience/allow for accessibility, universal design, sentimentality/endearament/nostalgia to ensure consumer satisfaction/continued purchasing;</p> <p>Consumers can choose much more complex phones if they wish;</p> <p>the Nokia range/products could be perceived as complicated/difficult to use (for some consumers);</p> <p>should provide challenge/technology use upskilling/provides a sense of satisfactory, reliability, safety, security nostalgia to ensure consumer satisfaction/continued purchasing;</p> <p>USP is ease – of – use/retro style;</p>	<p><i>Award [1] for identifying reasons why Nokia considers Roger’s characteristic of complexity as an important aspect in the commercial success of its products up to [3 max].</i></p> <p><b><i>Do not award marks across clusters.</i></b></p>	3

Question		Answers	Notes	Total
2.	a	<p>lower thermal expansion; the ability to resist cracking/shattering;</p> <p>lower thermal conductivity; the handles/lid will be safer;</p> <p>non-toxic; as some metal pans contain lead/metal residue can contaminate food;</p> <p>transparent/see through; Allowing the user to see contents inside/better control the cooking process;</p> <p>easy to clean/hygienic;</p> <p>glass pot and pan set does not stain/retain odours compared to metal and plastic cookware;</p> <p>dishwasher/microwave safe;</p>	<p><i>Award [1] per advantage of using borosilicate glass for the cooking pot shown in <b>figure 5</b>, compared to traditional aluminium metal pot for [2 max].</i></p>	2
2.	b	<p>increases the need for disassembly/separation of materials/energy/time; as it is made from metal and plastic/joined materials;</p>	<p><i>Award [1] for one disadvantage of the aluminium cooking pot with plastic handles with regards to disposal. for up to [2 max].</i></p>	2

Question			Answers	Notes	Total
3.			<p>Small batch production; wasting/subtractive;</p> <p>wood is cut/machined (CNC)/abraded;</p> <p>creates a smooth/rounded/safe finish;</p>	<p><i>Award [1] for each of the manufacturing processes that Teeny Chompers uses to create the teether shown up to [3 max].</i></p>	3
4.			<p>the level at which a resource is renewable/the rate that a resource can be replenished;</p> <p>as trees can be replanted /grown for future harvests;</p> <p>can take longer to grow/provides a slow supply;</p>	<p><i>Award [1] for each reason why using hardwoods limits renewability. [3 max].</i></p>	3

**Section B**

Question		Answers	Notes	Total
5.	a	<p>design for disassembly refers to designing products in such a way that they can be easily taken apart;</p> <p>to aid repair/reuse/recycling/reconditioning/re-engineering;</p>	<p><i>Award [1] for each principle of design for disassembly influences the longevity of the Penny Skateboard [2 max].</i></p>	2
5.	b	<p>anthropometric data refers to measurements of the human body (such as the height/weight of the rider);</p> <p>used in the design of the skateboard deck to optimise comfort/safety;</p> <p>to accommodate the rider’s shoe size/shape;</p> <p>anthropometric data refers to measurements of the human body (such as the height/weight of the rider);</p> <p>which can affect the flex/stiffness of the deck;</p> <p>therefore, needs to be considered to optimise for specific needs of the rider;</p>	<p><i>Award [1] for each reason why anthropometric data is required in the design of the Penny skateboard deck up to [3 max].</i></p> <p><b><i>Do not award marks across clusters.</i></b></p>	3
5.	c	<p>function refers to the skateboard's ability to perform the intended task; providing a stable/safe/smooth ride; the shape/strength/choice of materials will affect the skateboard’s performance;</p> <p>form refers to the skateboard's shape/visual appearance/aesthetics; such as the textured surface of the skateboard deck/colour/elongated shape; which makes the shoes of the rider grip/safer/understand the direction/use of the skateboard;</p>	<p><b><i>Award [1] from the first cluster each consideration involved in achieving a balance between form and function when designing the Penny skateboard up to [3 max].</i></b></p> <p><b><i>Do not award marks across clusters</i></b></p> <p><i>Mark as [3] + [3].</i></p>	6

Question		Answers	Notes	Total
5.	d	<p><b>Instrumented models</b> physical prototypes equipped with the ability to take measurements/provide quantitative data;</p> <p>sensors can provide data on the effect of different surfaces/terrain; on the skateboard deck;</p> <p><b>Motion capture</b> the recording of human movement by means of video/magnetic/electro-mechanical devices;</p> <p>such as the foot position on the skateboard deck whilst in use/performing tricks; to ensure the size/shape of the skateboard deck is optimised;</p> <p><b>Formal drawing techniques</b> drawings that are used to aid the assembly/production of a product;</p> <p>such as orthographic projection/section drawings/part drawings/assembly drawings/plan drawings;</p> <p>including all necessary measurements/scale/parts/components;</p>	<p><i>Award [1] an explanation for each reason of the advantages of using <b>instrumented models</b> during the design development of the Penny skateboard up to [3 max].</i></p> <p><i>Award [1] an explanation for each reason of the advantages of using <b>motion capture models</b> during the design development of the Penny skateboard up to [3 max].</i></p> <p><i>Award [1] an explanation for each reason of the advantages of using <b>formal drawing techniques</b> during the design development of the Penny skateboard up to [3 max].</i></p> <p><i>Mark as [3] + [3] + [3].</i></p> <p><b>Do not award marks across clusters.</b></p>	9

Question		Answers	Notes	Total
6.	a	<p>the technology push comes from the development of smart sensors/monitoring devices/cloud-based technologies;</p> <p>to allow the user to gather/record/share a range of accurate real time data;</p>	<p><i>Award [1] for outlining the influence of technology push on the design of the Smart Kayak up to [2 max].</i></p>	2
6.	b	<p>conceptual modelling originates in the mind/develops with the designer's imagination;</p> <p>to communicate the concepts/ideas to the design team/manufacturer/client/user (using physical/graphical /CAD models);</p> <p>to gain feedback/gauge their reaction/aid further development;</p>	<p><i>Award [1] for an explanation of one benefit for using conceptual modelling in the early parts of the design phase of the Smart Kayak for up to [3 max].</i></p>	3

Question 6 continued

Question		Answers	Notes	Total
6.	c	<p><b>End-of-pipe technologies</b>                      these reduces pollutants/waste at the end of a process;                      before it is discharged into water bodies such as rivers, lakes, or oceans;                      by using sedimentation/filtration/disinfection/biological treatment;                      they can help to reduce the amount of water consumed by industries;                      by recycling/reusing wastewater;                      reducing the manufacturing water footprint/minimize the amount of polluted water that is discharged into the environment;                      help to monitor/control the quality of wastewater that is discharged into the environment;                      which is achieved using sensors/monitoring systems;                      that can detect and measure pollutants in wastewater;</p> <p><b>Environmental legislation</b>                      some countries cannot afford to enact the legislation/green legislation;                      which may hinder (or promote) economic growth;                      due to their (low) level of economic development;                      companies may be reluctant to invest;                      as legislation could result in the reduction of profits;</p>	<p><i>Award [1] for an explanation of how end-of-pipe technologies can lower water contamination up to [3 max]</i></p> <p><i>Award [1] for an explanation of how why some countries are hesitant to pass environmental legislation up to [3 max]</i></p> <p><i>Mark as [3] + [3].</i></p> <p><b><i>Do not award marks across clusters.</i></b></p>	6

			leading to reduced income for governments/employers; investment in existing infrastructure; may become redundant/require modification/updating; which can be expensive/economically unfeasible;		
--	--	--	--	--	--

*Question 6 continued*

Question		Answers	Notes	Total
6.	d	<p><b>Comfort:</b>                      anthropometric/ergonomic data can be used in the design of the kayak’s seat/foot rest;                      to fit a range of users;/adjustability of feet positions                      preventing discomfort/injury being sustained to the back/poor posture;</p> <p><b>Safety:</b>                      the seat should be ergonomically designed;                      to prevent fatigue/ appropriate width and length of the kayak as a safety measure;                      as it will be used over long periods of time;</p> <p><b>Performance:</b>                      biomechanics of the movement during paddling/which controls can be analysed;                      enabling the designer to consider the reach/movement/force needed;                      to operate the controls/paddles efficiently;</p>	<p><i>Award [1] for an explanation how the study of human factors can be used to improve the comfort of the Smart Kayak seating area up to [3 max].</i></p> <p><i>Award [1] for an explanation how the study of human factors can be used to improve the safety of the Smart Kayak seating area up to [3 max].</i></p> <p><i>Award [1] for an explanation how the study of human factors can be used to improve the performance of the Smart Kayak seating area up to [3 max].</i></p> <p><i>Mark as [3] + [3] + [3].</i></p> <p><b>Marks cannot be awarded twice but marks can be awarded across clusters.</b></p>	9

Question		Answers	Notes	Total
7.	a	<p>Qualitative/subjective data measures user satisfaction relating to the comfort of the helmet;</p> <p>providing user’s opinion about levels of comfort/discomfort (e.g., on a scale from 1 to 5 ranging from very comfortable to very uncomfortable);</p>	<p><i>Award [1] for outlining <b>one</b> reason why an ordinal scale is used to collect data about the comfort of the Airbag bike helmet up to [2 max].</i></p>	2
7.	b	<p>multidisciplinary approach includes a number of members with different skills/expertise;</p> <p>which can cause conflict/issues with communication;</p> <p>leading to delays/additional costs;</p>	<p><i>Award [1] for an explanation of <b>one</b> disadvantage of using a multidisciplinary approach in the design and development of a new product such as the Airbag bike helmet up to [3 max].</i></p>	3
7.	c	<p><b>hardness</b> the resistance a material offers to penetration/scratching; such as withstanding regular use/occasional impacts without losing its structural integrity; ensures durability/longevity/protects the inner core of the helmet/resist damage from regular use and impacts.</p> <p><b>toughness</b> the ability of a material to resist the propagation of cracks; such as to protect the airbag/head from impact in the event of an accident; as it will absorb/dissipate the force of an impact,</p>	<p><i>Award [1] for an explanation of the importance of selecting materials to suit the physical properties of hardness needed for the outer shell of the Airbag bike helmet up to [3 max].</i></p> <p><i>Award [1] for an explanation of the importance of selecting materials to suit the physical properties of toughness needed for the outer shell of the Airbag bike helmet up to [3 max].</i></p> <p><i>Mark as [3] + [3].</i></p>	6

					<b>Marks cannot be awarded twice but marks can be awarded across clusters.</b>	
--	--	--	--	--	--	--

Question 7 continued

Question		Answers	Notes	Total
7.	d	<p><b>Life Cycle Analysis</b> to understand the environmental impact of the Airbag helmet service at every stage of its life cycle; from pre-production; production; distribution (including packaging); utilization; and disposal; to make decisions to reduce the overall impact on the environment;</p> <p><b>Environmental impact assessment matrix</b> focusing on one stage of the LCA at a time and breaking processes down into individual steps; focusing on an output; in terms of resources used, wasted and by-products generated and released (such as greenhouse gas emissions/water pollution/habitat destruction/soil pollution);</p> <p><b>Design for Environment software</b> used during the design stages/uses CAD; to simulate choice of materials/manufacturing techniques;</p>	<p><i>Award [1] for an explanation why designers use the Life Cycle Analysis to assess the environmental impact of the Airbag helmet's life cycle up to [3 max].</i></p> <p><i>Award [1] for an explanation why designers use the Environmental impact assessment matrix to assess the environmental impact of the Airbag helmet's life cycle up to [3 max].</i></p> <p><i>Award [1] for an explanation why designers use the environmental impact</i></p>	9

			optimise designs to get cost effective products that are environmentally concerned;	<i>of the Airbag helmet's life cycle up to [3 max].</i> <i>Mark as [3] + [3] + [3].</i> <i>Marks cannot be awarded twice but marks can be awarded across clusters.</i>	
--	--	--	---	--	--

---