

2019 VCE Product Design and Technology examination report

General comments

Students who had a strong grasp of the terminology and correctly interpreted the context of the questions produced high-scoring responses. However, many students were not able to differentiate between the end-user point of view and the industry point of view, or between a finished product and one in development.

Some students wasted space and time by re-writing questions in full, which was not required and often limited their response.

Important terms were not always used correctly:

- Many students assumed that ‘sustainability’ only implies a long-lasting product or material.
- Some students referred to ‘human-centred design’ as a factor instead of ‘user-centred design’.
- Many students used the word ‘ensure’ inappropriately, when more appropriate wording would be to ‘check’, ‘assist’ or ‘improve the likelihood’.

Students are reminded to draw responses for the design brief question directly from the given scenario.

Teachers and students are reminded to refer to the current VCE Product Design and Technology Study Design 2018–2022 as the reference for all terminology.

Areas of strength in student responses included:

- knowledge of Steps 2–4 in the first stage of the product design process: design brief, evaluation criteria and research
- using the information and images provided when analysing products
- knowledge of computer-aided design (CAD) and its role in design and development
- understanding of intellectual property (IP)
- knowledge of anthropometric data and its application
- creating a question to compare torches for quantitative data
- identifying an area of research for the design brief
- developing care labels or instructions for the designed product.

Students were generally less successful in:

- differentiating between a creative and a critical thinking technique
- considering which aspects to consider for Design for Disassembly (DfD)
- understanding areas of legal responsibility
- understanding planned obsolescence and types of planned obsolescence
- understanding product design factors and their associated parameters – both in relation to product analysis and in constructing a design brief
- writing the context, end-users and requirements for a design brief drawn from the given scenario

- drawing types – the purpose of visualisations and the quality of drawing required for design options
- choosing the appropriate words or phrases to describe characteristics and/or properties of specific materials.

Specific information

Note: Student responses reproduced in this report have not been corrected for grammar, spelling or factual information.

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete answers.

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

Section A

Question 1

Marks	0	1	2	3	Average
%	41	13	7	39	1.5

The correct response was Step 2 Design brief, Step 3 Evaluation criteria and Step 4 Research.

Many students were confused about the order of steps or wrote the names of stages. Some students missed this question altogether.

Question 2

Marks	0	1	2	Average
%	2	12	86	1.9

Most students included the context of use along with identifying an end-user.

The following is an example of a high-scoring response.

An adventurous individual who camps and rides bikes. The torch may be used for his/her camping trips as a lantern or flashlight.

Question 3a.

Marks	0	1	Average
%	39	61	0.6

Questions aiming for quantitative data for comparison needed to be targeted to the product and its various aspects. Many students incorrectly wrote a question for the end-users'/consumers' habits or directed the question at a torch owned by one end-user or specifically at the Klarus torch.

Acceptable questions were those that:

- required a yes/no response
- asked for a numerical rating, or
- provided specific features or prices that recipients could choose from.

This type of question could gather quantitative information that allowed a comparison of torches on the market.

The following are examples of high-scoring responses.

How well does this torch satisfy your needs and wants on a scale from 1-10?

and

Do you prefer your torch to be battery powered or rechargeable with USB charging cord?

Question 3b.

Marks	0	1	2	Average
%	20	36	44	1.3

Most students understood how quantitative data could be used to compare existing products and to differentiate or improve the Klarus torch, thereby assisting in its success.

Many students were not clear that the information could be used to feed back into the design or marketing of the torch. Some students responded as if the torch was manufactured as a 'one-off'.

The following is an example of a high-scoring response.

It helps provide statistics for the designers, providing data for possible improvements.

Question 4a.

Marks	0	1	2	Average
%	27	31	43	1.2

Possible answers were as follows:

Product design factor	Description
User-centred design	<ul style="list-style-type: none"> Should suit users to improve their quality of life Should be comfortable for users
Purpose, function and context	<ul style="list-style-type: none"> The primary function is to provide a multi-use light; therefore, it should perform effectively for all its purposes The secondary functions, such as switches and handles, should all support its primary function of providing light
Technologies	<ul style="list-style-type: none"> How it is made is important so that it works in all situations when needed
Innovation & creativity	<ul style="list-style-type: none"> Adding multi-coloured light-emitting diode (LED) lights to make the torch more useful
Legal responsibilities	<ul style="list-style-type: none"> Must be safe when being used

Many students appropriately chose 'purpose, function and context' or 'user-centred design' as important to the primary function of the torch.

The following are examples of high-scoring responses.

User centred design plays an important role as the torch must be comfortable to hold as well as the buttons must be easily located in the dark.

and

Purpose function and context: for the torch to fulfil its primary function its role must be suited to the context in which it is to be used. E.g. it must be able to attach to a handle bar and a tent, specifics of the context.

Question 4b.

Marks	0	1	2	Average
%	8	31	61	1.6

This question was answered well. Many students chose a physical test; others wrote about gaining feedback from end-user trials, which was an acceptable response.

The following are examples of high-scoring responses.

The multifunction torch could have been tested under water to ensure the multifunction torch is waterproof up to two metres.

and

User trials could be used allowing end-users to get a hands-on approach to the product. Designers can then interview end-users and ask them about their expectations and if the product met those expectations.

Question 4c.

Marks	0	1	2	Average
%	27	33	40	1.1

Many students did not respond to this question on aspects of DfD. Some wrote unrelated aspects such as 'biodegradable material', which is possible but not necessary for DfD.

The following are examples of high-scoring responses.

Materials are easy to identify.

Use of screws for easy separation of parts.

and

Elimination of glues ensures easy disassembly.

Labelling parts helps the recycling process.

Question 5

Marks	0	1	2	Average
%	25	15	60	1.4

Many students wrote about a technological aspect of the torch rather than a new technology as listed in the study design (page 23). CAD was the most common response. Rapid three-dimensional (3D) prototyping and laser were acceptable if the student explained their use during the design and development stage, not in manufacturing. However, many chose technologies (e.g. CNC and robotics) used in manufacturing only, and therefore did not score any marks.

The following are examples of high-scoring responses.

CAD - can be used during design to accelerate the process of creating visualisations and design options. It allows easy modifications of designs and can also produce 3-D (virtual) prototypes.

and

3-D printing could have been used. 3-D printing allows for the torch to be made to scale which would allow the designers and manufacturers to see how all of the parts look together in proportion.

Question 6

Marks	0	1	2	Average
%	36	14	50	1.2

Successful responses for this question mentioned the handle, the one-handed operation feature or the switches on the torch that would be designed with reference to anthropometric data. Most understood it is data collected from a large number of people and that it is applied when designing products to suit humans. Some chose the LED lights, but this feature is not related to anthropometric data. Notably, some students chose the 'waterproof' aspect of the torch or its ability to function as a 'hands free' lantern as related to anthropometric data, which are not relevant.

The following is an example of a high-scoring response.

Simple one-handed operation – anthropometric data and in particular the size of hands and fingers could have been looked at during the design and development stage to allow designers to put buttons not too far apart and still make it comfortable to use with one hand.

Question 7

Marks	0	1	2	Average
%	31	31	38	1.1

Overall this question was answered well. Many students demonstrated unfamiliarity with intellectual property (IP) by focusing their response around safety, which may have been a confusion with the legal status of Australian Standards. Others suggested that IP protects ideas, whereas IP protects a 'work' (i.e. ideas expressed in a physical form).

The following is an example of a high-scoring response.

It is important to ensure that designers' works are protected, so that they can benefit from the sales of their designs, and to make sure nobody uses their designs and passes it off as their own. It is also a legal responsibility, as if a design is stolen it may result in legal action.

Question 8a.

Marks	0	1	2	3	4	5	6	Average
%	10	2	6	28	24	19	10	3.5

While students could easily identify a product feature from the photograph and information provided on the Nireeka e-bike, fewer were able to link the feature to a parameter as listed in the study design.

The following are examples of high-scoring responses.

Product feature	Related parameter
<ol style="list-style-type: none"> 1. Hydraulic disc brake 2. Shock absorber 3. Monocoque carbon fibre frame 	<ol style="list-style-type: none"> 1. safety 2. ergonomics and comfort 3. strength of materials

Question 8b.

Marks	0	1	Average
%	64	36	0.4

Acceptable answers were:

- using feedback from end user/s about the design
- applying evaluation criteria
- checking suitability of proposed materials by testing materials or processes involved in the design
- making final decisions on materials or aesthetics
- questioning suitability or functional aspects of the design
- researching to check facts, sizes, material suitability or other specifics
- checking dimensions of the design or its intended environment
- testing a mock-up or prototype
- creating 'working drawings' to check viability or finalise the design
- using a PMI strategy.

Students struggled to list a critical thinking technique used to refine the preferred option. Many students wrote 'brainstorming', which is considered a creative thinking technique. If stating 'research', students needed to add its purpose at the preferred option stage. Overall, students who wrote a phrase demonstrated a more accurate technique than students who provided one-word responses.

Question 8c.

Marks	0	1	2	3	Average
%	52	15	21	13	1.0

An acceptable response would be:

- A critical thinking technique such as creating working drawings of the preferred option would have been used in the design and development of the Nireeka bicycle. The working drawing would define the exact measurements of parts such as the seat height and pedal length. This could then be checked as suitable.

Many students were able to list a critical thinking technique in Question 8a., yet confused their explanation on its application to the e-bike by referencing a creative thinking technique. Critical thinking techniques are those that narrow down or assist in finalising decisions, not ways of coming up with more ideas. To score full marks, students needed to relate their response to something specific about the Nireeka e-bike.

Question 8d.

Marks	0	1	2	3	4	Average
%	31	15	28	8	17	1.7

The response to this question had to be from an area of legal responsibility other than IP. This could be Australian/International standards, occupational health and safety (OH&S), product safety, regulations and/or legislation. Many students included copyright, patents, design registration or trademarks in their response, indicating they weren't aware of the different types of IP.

The following are examples of high-scoring responses.

OH&S as it is important to acknowledge the health and well-being of the workers who make the product.

and

Australian and international standards ensuring that the bike meets regulated safety standards and is safe for use.

Question 8e.

Marks	0	1	2	Average
%	13	28	59	1.5

Some students wrote only about an end-user profile being useful without mentioning the importance of research in developing the profile. Some talked about developing the end-user, forgetting to add the word 'profile'. Students generally understood that researching the end-user could result in a product that is more suitable.

The following is an example of a high-scoring response.

This (research) would have allowed the designers to gain insight into who will be the main end-user of the bike, and with this they could have designed the bike with their needs and wants in mind.

Question 9

Marks	0	1	2	3	Average
%	42	17	22	20	1.2

This response needed to describe style, functional or technical, as a type of planned obsolescence. It also required an indication of how it affected the designer and manufacturer of the Nireeka e-bike, such as the expense and work needed to develop a new bicycle on the market, or profits gained from new models.

Many students talked about battery life, which is not relevant to the question (or planned obsolescence). Many students chose a technological feature of the bike in their response but did not explain technological obsolescence or how it affected the designer/manufacturer.

The following are examples of high-scoring responses.

Functional obsolescence may influence the buyer depending on how long the electric bicycle is designed to last. It also impacts the designer and manufacturer. If the bicycle is designed to not last a long time, the designer and manufacturer must create new models more frequently and at a higher rate, thus increasing income.

and

One type of planned obsolescence that may influence the buyer is **technological obsolescence**. As new technology is released the electric bike may become out of date. This may affect that designer as it might mean that more research should be conducted to establish the most up to date technology or plans made to upgrade or replace old technology with new in future designs.

Question 10

Marks	0	1	2	Average
%	15	40	45	1.3

The question asked about innovation and creativity in the product development process. Therefore, students' responses needed to include the importance of:

- being competitive for industry
- increasing sales
- differentiating a product on the market, or
- its appeal in the market.

Many students responded from the consumer point of view only (i.e. that it gave consumers more choice).

Question 11a.

Marks	0	1	2	Average
%	42	39	19	0.8

An acceptable response indicated that a **hazard** is the dangerous thing, action or behaviour that can cause harm; a **risk** is the chance/possibility of it happening or the level/likelihood of harm.

Most students were clear on what a hazard is but not so clear on risk and therefore found it difficult to define the difference between them.

The following are examples of high-scoring responses.

Risk: the potential for danger or hazard. Hazard: what the danger actually is.

and

A hazard is a dangerous situation whereas a risk is the level of danger it poses to individuals

Question 11b.

Marks	0	1	2	Average
%	24	34	42	1.2

Some students wrote about hazard identification in relation to a product, when the question was clearly asking about the production process. To gain full marks, the response needed to include how the hazard could be controlled.

The following is an example of a high-scoring response.

Risk assessment will be needed in the production process. Outline all the machine and workspaces that may be used during the process, state the potential injuries that might appear in these spots, also list the control of hazard and the methods to prevent. These may reduce the hazard from the production process.

Section B

Question 1

Marks	0	1	2	3	4	5	6	7	8	9	10	Average
%	5	10	10	8	9	9	11	9	8	9	12	5.4

Responses needed to extract the necessary information from the design scenario.

Outline of context

Expected responses were as follows.

My local or nearest gallery (could include the name or town's name) is hosting an exhibition on the region's history in relation to (an aspect of history) in 2020.

End user/s	Product
Staff of the gallery/museum Visitors to the gallery/museum	Gift sales display counter
Gallery/museum staff/tour guides	Tour guide uniform
Visitors to the gallery/museum Recipient of a gift from a gallery/museum visitor	Coordinated jewellery set

Students who outlined the context, the end-user and four product design factors with parameters drawn from the scenario scored well.

Many students wrote the name of the product or end-user in the space provided for the context. A large number of students wrote 'Melbourne Museum', which was funding the exhibition, but this did not constitute the context. More relevant to the context were community galleries and museums in Victoria that were making submissions to present an exhibition on local history in 2020.

Consequently, many students overlooked the requirement in the scenario for the product to be related to something historical.

Most identified the end-user of their product correctly.

Product design factors and associated parameters

Marks were awarded for each correctly named factor and each reasonable/suitable parameter drawn from the scenario and product list. Many students did not know the product design factors sufficiently to write them correctly in the left column. Others did not understand the meaning of 'associated parameters' (requirements drawn both from the scenario and the product list). Some students included the product design factor 'sustainability' when there were no sustainability requirements given in the scenario.

Question 2a.

Marks	0	1	Average
%	41	59	0.6

Possible responses were that it must:

- relate to a historical aspect of the region
- make the wearer easily identifiable as a tour guide
- display souvenirs and books so they can be easily viewed
- be lockable so that the gallery staff feel the contents are secure
- be unique, creative and innovative.

This question was mostly answered well. However, many students wrote a requirement that could not be found in their design brief, and therefore did not receive a mark.

Question 2b.

Marks	0	1	Average
%	37	63	0.7

Students needed to say why their response in Question 2a. was important to the end-user, rather than just state that it was important.

Possible responses were that it was important because:

- people have come to see the historical exhibition and the design should reflect that aspect
- the valuables are locked and staff don't have to worry all the time
- the tour guide feels proud and valued as an employee
- the wearer of the jewellery can relate it to history.

Question 3

Marks	0	1	2	Average
%	13	12	75	1.6

Most students were able to choose a constraint from the design scenario and write it as an evaluation question. Many students were able to include a detail from the scenario yet not in their design brief, suggesting confusion between the terms 'design scenario', 'design brief', 'requirements', 'design specifications' and 'associated parameters'.

Typical responses were as follows:

- Does the counter/uniform/jewellery make use of two or more materials?
- Does the product successfully incorporate a historical Victorian person/event/landmark?
- Does the counter have a lock-up section?
- Does the uniform make the wearer easily identifiable as an employee?
- Will the product be finished and ready by 2020?
- Are the three pieces of jewellery well coordinated?

Question 4

Marks	0	1	2	Average
%	34	18	47	1.2

While most students easily identified an area of research, some had difficulty stating a parameter from their design brief and did not receive full marks.

The following are examples of high-scoring responses.

360-degree rotating section - I could conduct primary market research and learn about what bearings are needed for this function. I could look at already established products that have this feature and understand how it works.

and

Must relate to an individual, group, Landmark or event. Research could be conducted on the history of Victoria and the land on which the CBD was established.

Question 5

Marks	0	1	2	Average
%	13	25	61	1.5

Most students could identify a specific material but many wrote a broad category such as 'timber' or 'metal'. Many students wrote about the reasons why the material was selected without mentioning any characteristics or properties.

The following are examples of high-scoring responses.

Bamboo fabric. It is thermo-regulating and fairly stretchy. These will ensure a comfortable time whilst wearing the garments.

and

Victorian Ash. It is a hard wood and is strong/durable. It has a nice colour and look to it.

Question 6

Marks	0	1	2	3	4	5	6	Average
%	2	2	13	16	29	18	21	4.1

Overall, visualisation drawings were good, but needed to include some reference to a historical aspect. Many students put more colour, detail, time and effort into the visualisation drawings than the design option. Students do not need to render or colour these drawings.

Question 7

Marks	0	1	2	3	4	5	6	7	8	9	10	Average
%	4	2	3	6	8	13	18	18	13	9	5	6.0

The design option drawing should demonstrate command of the visual, tactile and aesthetic parameters, be suitable for the purpose and have enough detail to communicate this clearly. It should further enhance creative or innovative ideas from the visualisations. Annotations need to be legible and reflect requirements from the design scenario, which need to be visible in the drawing. This year there needed to be four annotations.

To score well, students needed to create a design that:

- was realistic and filled the space provided
- solved the functional requirements of the brief
- was rendered to represent materials or textures
- demonstrated some creativity or innovation in how it reflected a historical aspect
- was annotated to indicate four requirements from the design brief/scenario
- had enough detail to communicate how it could 'work' or be constructed.

Some students did not attempt this question.

Question 8

Marks	0	1	2	3	Average
%	34	29	26	10	1.2

Many students could discuss safety considerations of their product but found it difficult to relate safety to improving the function.

The following are examples of high-scoring responses.

Gift counter. The corners were rounded to prevent injuries via cuts. It will also be more suitable for a museum if it is safe, improving the functionality of the product, such as ensuring there are no dangerous choking hazard for little kids.

and

Tour guide uniform. The product's function is to worn by a staff, should the staff be endangered by the product then it will not be worn, inhibiting it from completing its function. Incorporating safety encourages end-user use.

Question 9a.

Marks	0	1	2	Average
%	33	31	36	1.1

Most students could identify a construction process used to assemble their product, describe why it was suitable and include equipment. Others identified processes that were not suitable for use in the assembly phase of construction, such as cutting materials or finishing techniques. Some students listed a scale of manufacturing, such as 'one-off', which implied they were confused about the terminology.

The following are examples of high-scoring responses.

Overlocking. An overlocker finishes seams in a neat professional manner cutting off excess fabric. This prevents fraying of seams and reinforces the strength of the product.

and

Biscuit joins. Using a biscuit cutter and biscuits to join pieces of timber together to add width. Ensuring that PVA glue and sash clamp are used so that the joint is stable and enhances maximum performance of the product.

Question 9b.

Marks	0	1	2	Average
%	41	11	48	1.1

Students needed to name an unsuitable process within the realms of probability.

The following are examples of high-scoring responses.

Gluing. Glue will not hold seams together with sufficient strength. Overtime and with washing the seams will degrade. Glue may also tarnish the exterior appearance of the product.

and

Butt joints. The use of a butt join is reasonably weak and it will struggle to hold a heavy load of goods on the gift to South counter. This joint will be unsuitable as it will not provide durability.

Question 10

Marks	0	1	2	Average
%	22	42	36	1.2

Most students could easily list a potential problem but many struggled to explain how it could be addressed through an activity in the product design process.

Acceptable activities for addressing the problem:

- 3D printing of parts or whole to check size and proportions
- research on various aspects
- trials or tests on various aspects.

The following are examples of high-scoring responses.

The display area for magazines isn't big enough. This could have been addressed through the design option stage by the designer getting feedback on his/her design options.

and

Size of the clothing. The designer could have addressed the problem by collecting measurements of an employee.

Question 11

Marks	0	1	2	Average
%	13	29	59	1.5

Students could easily list instructions but some used both label templates. In this case, students were scored on their content in the first template.

Most common textile responses were:

- Do not dry clean, wash in cold water with mild detergent
- Dry clean only, sponge out food spills immediately
- Warm wash with mild detergent, hang out of direct sunlight
- Machine wash and line dry

The following is an example of a high-scoring response.

Counter: Keep the product out of direct sunlight for prolonged periods of time to prevent deterioration. Clean and maintain with a damp rag.