

## **CAMBRIDGE NATIONALS**

*Exemplar Candidate Work*



# ***ENGINEERING DESIGN***

**J831, J841**

**R105 Summer 2019  
examination series**

Version 1

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# Introduction

These exemplar answers have been chosen from the summer 2019 examination series.

OCR is open to a wide variety of approaches and all answers are considered on their merits. These exemplars, therefore, should not be seen as the only way to answer questions but they do illustrate how the mark scheme has been applied.

Please always refer to the specification <https://www.ocr.org.uk/Images/150704-specification.pdf> for full details of the assessment for this qualification. These exemplar answers should also be read in conjunction with the sample assessment materials and the June 2019 Examiners' report or Report to Centres available from Interchange <https://interchange.ocr.org.uk/>.

The question paper, mark scheme and any resource booklet(s) will be available on the OCR website from summer 2020. Until then, they are available on OCR Interchange (school exams officers will have a login for this and are able to set up teachers with specific logins – see the following link for further information <http://www.ocr.org.uk/administration/support-and-tools/interchange/managing-user-accounts/>).

It is important to note that approaches to question setting and marking will remain consistent. At the same time OCR reviews all its qualifications annually and may make small adjustments to improve the performance of its assessments. We will let you know of any substantive changes.

# Question 1(a)

1 Fig. 1 shows an example of a smart watch.



Fig. 1

(a) Shown below are five requirements that inform the purpose of the product.

Join each of these requirements with the correct product feature.

One has been done for you.

### Purpose of the product

Be a wearable message receiver

Act as a fitness monitor

Be an accurate time piece

Be a personal navigation assistant

Process contactless payments

### Suggested product feature

Digital clock

Heart rate sensor

NFC chip

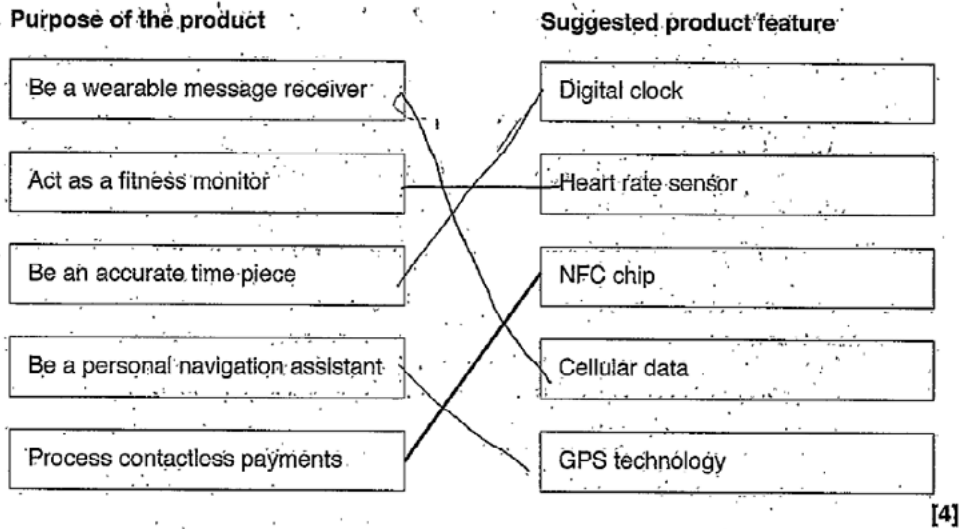
Cellular data

GPS technology

[4]

# Exemplar 1

4 marks



## Examiner commentary

Candidates made a good attempt at this question with many being able to correctly match the product purpose to the corresponding product feature. This candidate has got all four correct and given the full 4 marks.

## Question 1(b)

(b) State **three** pieces of information that designers could gather to help define the purpose of a product.

- 1 .....
- 2 .....
- 3 .....

[3]

# Exemplar 1

1 mark

- 1 Research on the internet.....
- 2 Review existing products.....
- 3 Optimise functionality.....

## Examiner commentary

This candidate has scored 1 mark for this question. While researching on the internet is a valid response, review of existing products is only repetition of the question. Optimising functionality does not constitute gathering information so scores no mark either.

## Exemplar 2

3 marks

- 1 the target market (who would buy it)
- 2 current technological innovations could shape the design
- 3 fashion trends

## Examiner commentary

This candidate was given 3 marks for their responses. All three points are valid information that could be gathered to define the purpose of a product. Each point is separate and distinct from the others (i.e. no repetition).

## Exemplar 3

1 mark

- 1 ~~The purpose of~~ how the product works
  - 2 The ergonomics of a product show where it will be used for
  - 3 ~~how it is designed~~  
The life span shows whether a product is of one-use or many
- (a) Explain why it is important for designers to define the purpose of a product before commencing

## Examiner commentary

This candidate was given 1 mark for their response. Only one response is relevant; how the product works. Both ergonomics and life span of the product are relevant at later stages of the design cycle so score no marks.

## Question 1(c)

- (c) Explain why it is important for designers to define the purpose of a product before commencing the design.

.....

.....

..... [3]

### Exemplar 1

3 marks

So that they know what features they should add to the device and what not to include, as to not waste time designing and resources designing a useless ~~feature~~ feature. [3]

### Examiner commentary

This candidate has clearly linked their response to the purpose of the product. They have identified fitness for purpose in terms of features to include and features not to include. This has been related to not wasting time and resources. The candidate therefore has three valid points scoring full marks for their response.

### Exemplar 2

3 marks

To ensure that they know the product is worthy to be manufactured and that it ~~can~~ <sup>will</sup> be sold to lots of people. If it isn't ~~is~~ for a good reason, the manufacturers may choose not to ~~design~~ <sup>continue</sup> it so they save materials and money and time. Also so they know their target audience and who ~~will~~ be using it. [3]

### Examiner commentary

In this response, fitness for purpose of the product has been related to product success and profit and to protecting money, time and materials in its manufacture. The candidate has made several valid points and so was given full marks for their response.

**Exemplar 3****1 mark**

it is important for designers to define the use of a product before commencing the design to make sure that the product has all the suitable features to allow it to carry out its purpose.

**Examiner commentary**

In this response the candidate has largely repeated the question making only one valid point: ensuring the product has the correct features. Only 1 mark was given for this response.

**Exemplar 4****2 marks**

because there could be a mistake made in the way the product is made making it unsuitable to use. Not defining the purpose means money, time and materials are wasted. [3]  
 so the product fully meets and fulfils the clients preferences or wants for the product.

**Examiner commentary**

This candidate has clearly identified that not fully defining the purpose of the product could lead to wastage of money, time and materials which are all valid points. They were given 2 marks. Error proofing, while relevant occurs in a later stage of the design cycle so secures no marks.



## Question 2(a)(i)

2 Fig. 2 shows a travel case.



Fig. 2

(a) State how each of the following limitations and constraints have impacted on the design of the travel case.

(i) Weight

.....  
 ..... [2]

### Exemplar 1

2 marks

use light weight material so doesn't limit the  
 amount that can be put in the case. [2]

### Examiner commentary

By specifying the use of lightweight materials for the travel case with a sensible reason (luggage weight restrictions) this candidate scored full marks for their response.

### Exemplar 2

2 marks

lighter materials are used so that more items can  
 be packed without exceeding the weight restrictions. [2]

### Examiner commentary

This candidate clearly relates the use of lighter materials for the travel case, linking this to weight restrictions. This response was given full marks.

**Exemplar 3****2 marks**

In order for the case to be effective it has to be portable and this is only achievable when the ~~the~~ case is light and this affects the materials it can be made from. [2]

**Examiner commentary**

This response relates the use of lightweight materials for the travel case to making it more portable. Both are valid points so securing full marks.

**Question 2(a)(ii)**

(ii) Size

.....  
 ..... [2]

**Exemplar 1****0 marks**

it has to be small enough to fit in a trolley compartment. [2]

**Examiner commentary**

This candidate has identified that the case needs to be 'small' without quantifying what this means. They have attempted to relate this to it fitting into the travel compartment. This response was given 1 mark due to its unclear quantification of size against other criteria.

**Exemplar 2****0 marks**

it must be an appropriate size depending on the target audience. [2]

**Examiner commentary**

This response scored no marks. It is too vague, and does not quantify any specific details on size, storage or manoeuvrability of the travel case.

**Exemplar 3****2 marks**

It must be small enough to carry  
and be portable, but still be  
large enough to store things in. [2]

**Examiner commentary**

In this response size of the travel case has clearly been related to how easy it is to carry and its portability. It is further related to its ability to store luggage. As there are at least two valid points made this response was given full marks.

**Question 2(a)(iii)**

(iii) Ergonomics

.....  
..... [2]

**Exemplar 1****2 marks**

User comfort, handle is/ must be  
comfortable to pull/hold. [2]

**Examiner commentary**

This candidate was given full marks for their response. The use of a comfortable handle making the travel case easier to move are both valid points relating to ergonomics.

**Exemplar 2****2 marks**

changed shape of handles to  
be more comfortable. [2]

**Examiner commentary**

By specifying that the shape of the travel case handle makes it more comfortable are both valid points. This candidate was therefore given full marks for this response.

**Exemplar 3****2 marks**

the adjustable handle ~~is~~ <sup>grip to help</sup> ~~the~~ <sup>people who</sup> ~~are~~ <sup>so that they</sup> ~~really~~ <sup>might</sup> ~~find it~~ <sup>easier</sup> ~~to~~ [2]

**Examiner commentary**

Two valid points are made by this candidate: grip and adjustable height of the handle. They therefore secure full marks for this response.

**Exemplar 4****0 marks**

By making it a square allows it to be compact when being stored and the area of the suitcase is large. [2]

**Examiner commentary**

This candidate unfortunately secured no marks for their response as it relates to aesthetics and not ergonomics of the travel case.

**Question 2(b)**

(b) Give **one** way the designer could change the 'aesthetics' of the travel case.

..... [1]

**Exemplar 1****1 mark**

They could change the colour ..... [1]

**Examiner commentary**

A valid response if made relating to aesthetics: colour. The candidate scores 1 mark for this response.

**Exemplar 2****0 marks**

Create a unique design so it stands out from other travel cases. [1]

**Examiner commentary**

This response is too vague to secure any marks. It must relate to a specific point on aesthetics.

**Exemplar 3****0 marks**

~~use~~ use cheaper materials so the cost would be lower. [1]

**Examiner commentary**

This response makes no points relevant to the aesthetics of the product and so is given no marks.

**Exemplar 4****1 mark**

adding a pattern to the case. [1]

**Examiner commentary**

This candidate specifies adding a pattern to the travel case which is clearly related to aesthetics. They were given full marks.

**Question 2(c)**

- (c) Explain how the designer has considered the working environment in the design of the travel case.

.....  
 .....  
 ..... [3]

**Exemplar 1****3 marks**

The designer has considered that the case will likely have to be treated roughly. This influenced the designer to make <sup>the</sup> case out of a sturdy material. The designer may have considered that the travel case may be used to hold fragile things. For this he could have given the case a soft inner lining. [3]  
 The designer also may have thought that the product will be dragged around a lot, so he gave the product wheels for ease of mobility.

**Examiner commentary**

This candidate makes three valid points relating to the working environment of the case: rough treatment therefore sturdy material, a strong material needed to protect the inside contents, wheels for the suitcase to be moved during use. They were given full marks for their response.

**Exemplar 2****3 marks**

The designer has considered the working environment by adding a retractable handle and wheels this allows it to be easily transported from A to B also there is a handle on the side so you can pick it up if you can not wheel it. [3]

**Examiner commentary**

This candidate makes three valid points in relation to the working environment; addition of wheels for easily moving, retractable handle and handle on the side when needed for carrying. They were therefore given full marks for this response.

**Exemplar 3****3 marks**

- it needs to have durable plastic so it won't break while getting through around.
- Strong wheels so they don't break while the case is fully loaded.
- handles are discrete so they don't get broken whilst in transit. [3]

**Examiner commentary**

The first two points are valid in relation to the environment; the use of durable plastic and strong wheels. The candidate was given benefit of doubt for their third response; the handles being discrete so that they can be retracted to not be broken. Full marks were therefore given.

**Exemplar 4****1 mark**

It has four wheels ~~at the~~ so that it can be ~~wheeled~~ taken to places easily.

**Examiner commentary**

This response lacks detail and only makes one valid point; the use of wheels to make the case easier to move. The candidate was given 1 mark.

## Question 3(a)

3 Product safety is a critical consideration for designers when developing new products.

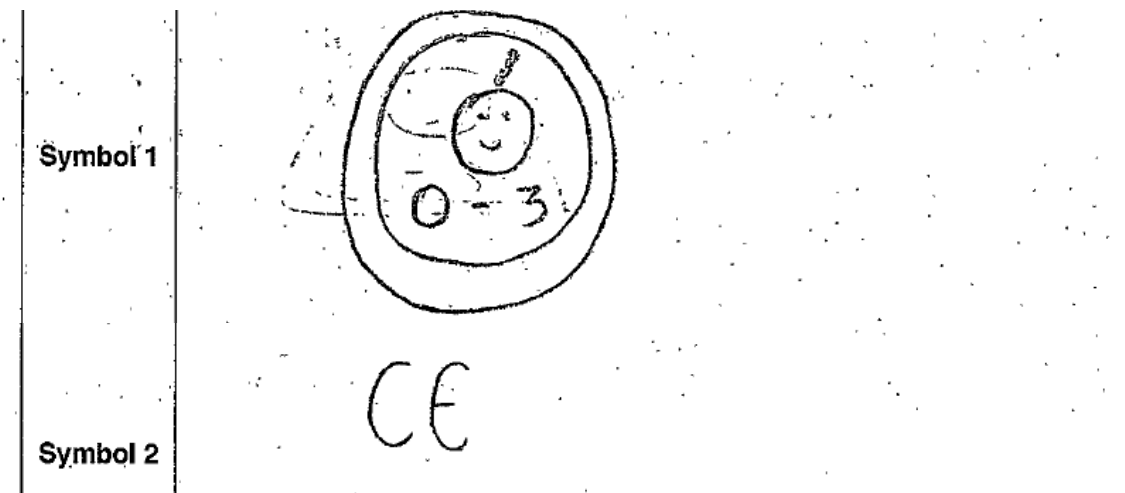
(a) Draw **two** symbols from the list below that could be included on a product.

- British Toy and Hobby Association Lion Mark
- Age restriction logo
- CE mark
- Highly Flammable

[2]

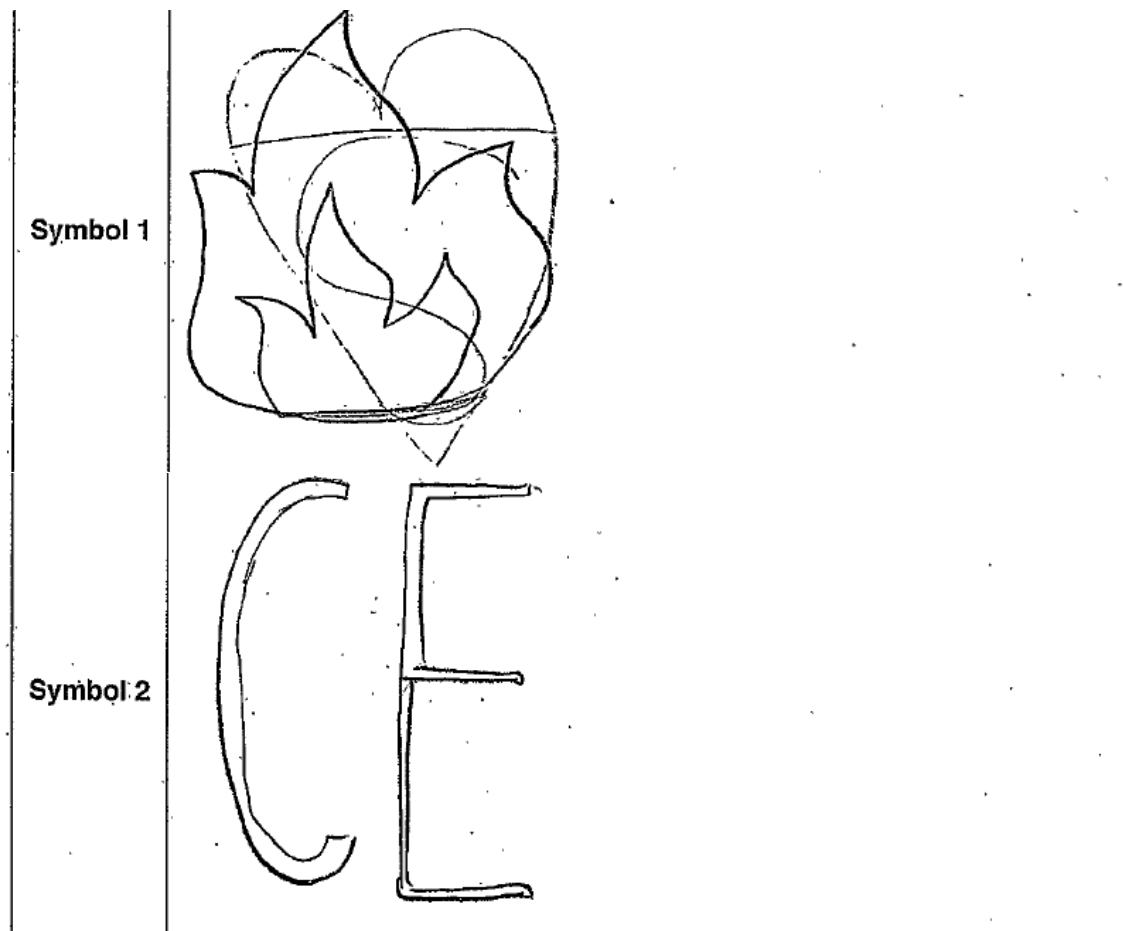
### Exemplar 1

2 marks



### Examiner commentary

This response was given 2 marks as there is sufficient detail in the drawing of the symbols. The CE mark letters are both correctly curved, while the age restriction symbol should have a crossed line through it. It does show sufficient detail though to be credited.

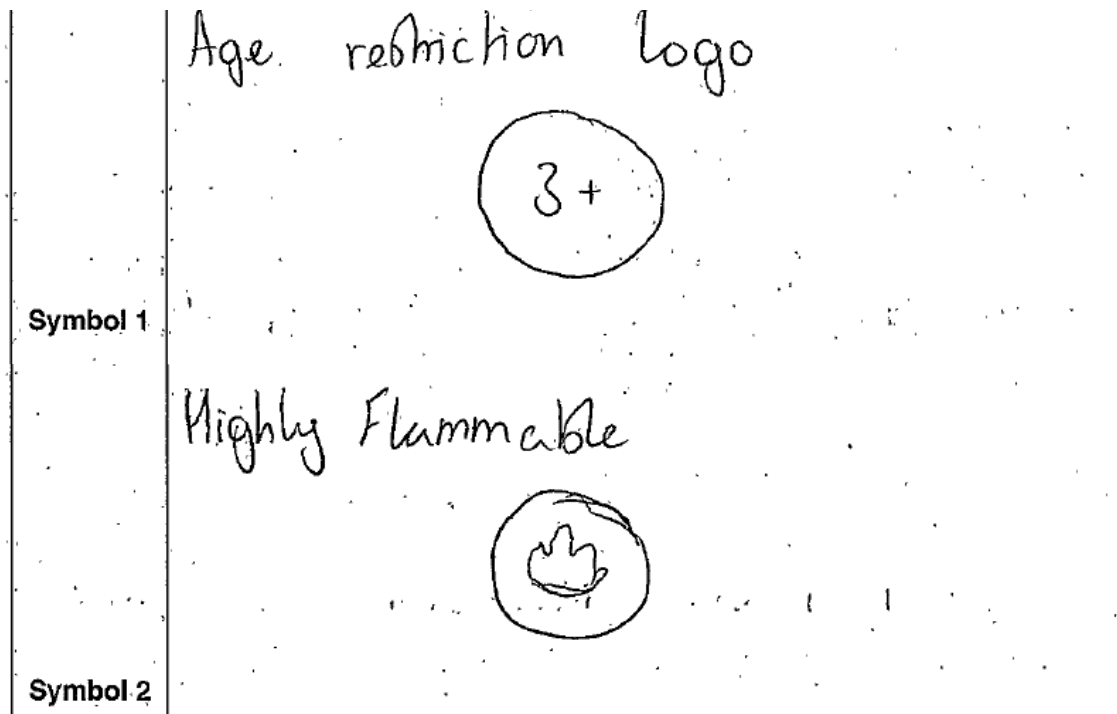
**Exemplar 2****0 marks****Examiner commentary**

This response secured no marks. The first symbol appears to be an overlay of the BS kitemark and flammable symbol while the letters CE should be curved in the second symbol.

**Exemplar 3****1 mark****Examiner commentary**

While the highly flammable symbol in this response could include more detail, it is generally of the correct shape. The response was therefore given 1 mark.



**Exemplar 4****0 marks****Examiner commentary**

This response received no marks as the age restriction symbol contains no detail, and the highly flammable symbol is the wrong shape.

**Exemplar 5****1 mark****Examiner commentary**

This response secures 1 mark as the highly flammable symbol is of the correct shape and clearly depicts a fire.

## Question 3(b)

(b) Give **two** reasons why product safety is an important consideration for designers.

1 .....

.....

2 .....

.....

[2]

### Exemplar 1

1 mark

- 1 If it is dangerous to users <sup>you</sup> should not sell it to the public.
- 2 If it is not safe to use then it's not safe to make and could hurt your employees.

[2]

### Examiner commentary

This response secures 1 mark, as the candidate has repeated the same point in both responses; the safety of the product so that users do not get hurt.

### Exemplar 2

2 marks

- 1 So customer do not injured and complain, impact on future sales.
- 2 As people can take legal action with the company, if injures them.

[2]

### Examiner commentary

In this response the candidate makes two separate and valid points; the potential impact on future sales and so that the company does not get prosecuted. This candidate therefore secured full marks.

## Exemplar 3

**2 marks**

- 1 ..... so that it's safe for customers  
to use .....
  - 2 ..... make sure it meets all the  
legislations it needs to .....
- [2]

### Examiner commentary

Two distinct and valid points are made in this response: product safety and meeting legislative requirements. Full marks were therefore given to this candidate.

## Exemplar 4

**2 marks**

- 1 ..... So they maintain a good  
reputation .....
  - 2 ..... So they do not get sued if  
someone gets hurt .....
- [2]

### Examiner commentary

This candidate provides two clear and valid reasons; company reputation and meeting legal obligations. Full marks were therefore given.

## Question 3(c)

(c)\* Discuss the difference between market pull and technological push.

.....

.....

.....

..... [6]

### Exemplar 1

4 marks

The difference between market pull and technology push is  
 Market pull is when the consumer demand new features  
 and functions from the manufacture for example we  
 demanded better cameras so the ~~manuf~~ <sup>manufactured</sup> put  
 out a digital camera. In technology push the  
 manufacturer put out new functions and features that  
 nobody asked for. An example of technology push is  
 Face ID and how nobody asked for face ID but the  
 manufacturer ~~was~~ added face ID to their phone.

### Examiner commentary

While only a short answer, this candidate has provided facts and details in their response. They have clearly identified the differences between market pull and technological push with examples in the response to support this. The candidate was given 4 marks (Level 2).

**Exemplar 2****1 mark**

market pull is when you use new technology to influence ~~the design~~ your design. technological push is when you push technology onto the user, e.g. AR etc, this means the user has to buy ~~the~~ <sup>the</sup> new product because it has new features

**Examiner commentary**

This response only provides one correct definition of technological push. There is no mention of demand, and no further quantification with examples in the response. The candidate therefore only secured 1 mark.

**Exemplar 3****2 marks**

Market pull is when shops and consumers have a need or demand for a product that has already been on the market. On the other hand technological push is when designers and developers create a new design and product which they promote to a shop and consumer that has not yet been proven to sell and is not in a great demand.

**Examiner commentary**

This candidate provides only a basic overview of market pull and technological push. It does not convincingly discuss the differences between each, and does not use specific examples to exemplify this. It was given 2 marks.

**Exemplar 4****4 marks**

Market pull is a product that customers want and ~~something~~ this is when a designer can redesign and manufacture a ~~new~~ improved product of something people want, but to suit different audiences, whereas technological push is when a designer uses new technology to "invent" a new product that there is a want for by customers but there is not yet a market for it, or something it can be when there isn't a demand for this new product but the designer believes it will come in demand when released.

**Examiner commentary**

The candidate provides clear definitions of market pull and technological push, quantifying the differences between these. It was given 4 marks. Had each been explored in greater depth with specific product examples then the candidate could have secured extra marks.

**Exemplar 5****5 marks**

Market pull is creating a product to suit the customers needs for example, longer battery life on phones because the market wanted it. Technology push however is designing / creating a product the market didn't know they wanted for example, facial ~~very~~ recognition on phones because the market didn't think about it but wanted it when it was created.

Market pull - pulling information for products from the market.

Technology push - pushing the product into the market. [6]

**Examiner commentary**

This candidate provides good definitions of market pull and technological push, with clear descriptions of the differences. They have attempted to relate this to products thereby securing 5 marks for their response.

## Question 4(a)

4 The table below contains various points that would be included in a design specification.

(a) Complete the table by adding **four** other points that could be included in a design specification.

[4]

### Exemplar 1

3 marks

1	Aesthetics
2	Ergonomics
3	Anthropometric data
4	Limitations and constraints, size, weight, functional limitations
5	Cost of Production to make <sup>the</sup> product
6	Product safety
7	<del>Selection of Product</del> - Materials Used.
8	Maintenance
9	<del>Selection of Product</del> target audience.
10	British Standards

### Examiner commentary

This candidate scored 3 marks for their response, as 'target audience' would not form part of a design specification, it would be considered earlier in the design process.

## Exemplar 2

**3 marks**

1	Aesthetics
2	Ergonomics
3	Cost
4	Limitations and constraints, size, weight, functional limitations
5	Materials
6	Product safety
7	Target market
8	Maintenance
9	Sustainability
10	British Standards

### Examiner commentary

This candidate has made three points securing 3 marks for their responses. Cost is not part of the design specification, and so is not credited.



## Question 4(b)

(b) Explain why a designer must define a design specification before manufacturing a design.

.....

.....

.....

..... [3]

### Exemplar 1

1 mark

So that the manufacturers know that the designer has  
 a good idea of what a design specification is and so  
 that the manufacturers know what kind of product they will be  
 producing. [3]

### Examiner commentary

This candidate makes one valid point why designers must define a design specification; so that manufacturers understand the product they are making. This is given 1 mark.

### Exemplar 2

3 marks

A designer must do this to ensure that the  
 design meets the criteria the company wants  
 and to ensure that the product does  
 its function whilst also being safe to use. [3]

### Examiner commentary

This candidate makes three valid points thereby securing 3 marks for their response. These are; meets the needs of the criteria set out by the company, serves its function and is safe to use.

### Exemplar 3

2 marks

Designers must do this in order to ensure they are going to cover  
 everything both the client and the customer are looking for in order  
 to ensure it is meeting requirements and will be made correctly.

### Examiner commentary

In this response, the candidate clarifies that the item will fit the needs of the customer and the client, also that the manufacturing method is appropriate. It therefore has two valid points scoring 2 marks.

## Question 4(c)

(c) State **three** areas that would be considered during a Life Cycle Analysis (LCA).

- 1 .....
- 2 .....
- 3 .....

[3]

### Exemplar 1

3 marks

- 1 raw materials
- 2 transport
- 3 manufacture

### Examiner commentary

The candidate states three clear and valid points relating to Life Cycle Analysis; raw materials, transport and manufacture. Full marks are therefore given.

### Exemplar 2

3 marks

- 1 The use of raw materials. Designers may wish to use recycled <sup>materials</sup> products to prevent environmental damage.
- 2 They may look at cost effective processes in production to cut down on energy and time.
- 3 They may look at the end of life phase and make the product easy to disassemble which allows for a greater amount of recycling.

[3]

### Examiner commentary

This candidate goes beyond just stating areas that would be considered as part of Life Cycle Analysis extending these with descriptions. These further descriptions did not gain the candidates any further marks as full marks were given for identifying the basic area alone.

## Exemplar 3

**2 marks**

- 1 Design for Disassembly
- 2 Design for Assembly
- 3 End of life cycle (Recyclable)

### Examiner commentary

While this candidate has provided three responses, there is too much similarity between design for assembly and disassembly for two separate marks. This response was given a total of 2 marks; design for assembly/disassembly and end of life.

## Exemplar 4

**1 mark**

- 1 product safety - A product must stay safe to use.
- 2 maintenance - the product must be fixable/maintainable.
- 3 Durability - a product should last long with use.

### Examiner commentary

This response only scored 1 mark for identifying maintenance as part of Life Cycle Analysis (LCA). Both product safety and durability are not part of LCA and so secure no marks.

## Question 5(a)(i)

5 Process planning is an important part of the development of new products.

(a) (i) State which phase of the design cycle includes process planning.

..... [1]

### Exemplar 1

1 mark

identify phase.....

### Examiner commentary

This candidate provides the correct response; identify phase. This is given 1 mark.

## Question 5(a)(ii)

(ii) Give **two** reasons why designers would carry out process planning during this stage of the design cycle.

1 .....

.....

2 .....

.....

[2]

### Exemplar 1

0 marks

1 The design has been created and now  
it can be optimised for manufacturing.

2 It's before validate so the product isn't  
in a final marketable stage.

[2]

### Examiner commentary

This candidate has provided a confused response in which they have tried to make the link between stages of the cycles rather than stated specific reasoning for process planning. As this does not answer the question, no marks are given.

**Exemplar 2****1 mark**

- 1 ..... because you can base  
your design around this
- 2 ..... you are finding out the  
process before wasting money  
on prototypes [2]

**Examiner commentary**

The first point made by this candidate is too vague to be given credit. The second point, however, is valid as it makes the link to investing money and not causing wastage. This was given 1 mark in total.

**Exemplar 3****1 mark**

- 1 ..... so they can plan which manufacturing method  
would be best to use.
- 2 ..... so that it can be changed throughout  
the rest of the planning. [2]

**Examiner commentary**

This response was given 1 mark for the detail of choosing the right manufacturing method to be used. The second point in the response is not correct, securing no marks.

**Exemplar 4****2 marks**

- 1 ..... try to see if they have the right  
~~make~~ machines to make it
- 2 ..... to see how long it would take  
to make it and see if it is worth it [2]

**Examiner commentary**

This candidate makes two valid responses and so is awarded 2 marks. The first response relates to manufacturing, and the manufacturer ensuring they have the right machines. The second point relates to determining the time required to manufacture the product. Both are therefore valid points.

## Question 5(b)(i)

- (b) The situation and context are important factors when developing a design brief.

State the meaning of the following terms when considering the development of a design brief.

- (i) Situation

.....  
 ..... [2]

### Exemplar 1

1 mark

..... where and how the product will be used to see what  
 ..... needs are most key. Therefore what to focus the brief on ..... [2]

### Examiner commentary

This candidate clearly relates 'situation' to where the product will be used. This is given 1 mark. Had they expanded their response to say by whom they could have secured the further mark.

### Exemplar 2

0 marks

..... what a client wants you to design .....  
 (what the problem is) ..... [2]

### Examiner commentary

This response does not relate to the 'situation' as it does not refer to where and by whom the product will be used. It secures no marks.

### Exemplar 3

2 marks

..... ~~what they need the product to do for what is happens currently~~ what  
 the product needs to be used for and the target audience ..... [2]

### Examiner commentary

This response clearly identifies the usage of the product, and its target audience as being related to 'situation' It scores the full 2 marks.

## Question 5(b)(ii)

(ii) Context

.....  
..... [2]

### Exemplar 1

1 mark

.....  
..... [2]

### Examiner commentary

This candidate is given 1 mark for recognition of background to the problem (i.e. place and meaning). There are, however, not two separate points here to secure the full 2 marks.

### Exemplar 2

1 mark

.....  
..... [2]

### Examiner commentary

This response demonstrates that the candidate understands the meaning of the term 'context'. It was given 1 mark. Had the candidate expanded their response the full 2 marks could have been given.

## Question 5(c)

- (c) Describe how designers may use inspirational and iconic products to inform the development of a new design.

.....

.....

.....

..... [3]

### Exemplar 1

3 marks

They have looked at products which have set new and high standards in their field which make iconic products more desirable. By looking at other iconic products to develop a new design, you are incorporating the high standards the customers like and are applying that to your product to make it better which would also catch the customers eye. Eg. more hybrid cars from different companies. [3]

### Examiner commentary

This candidate makes several valid points relating to inspirational and iconic products. These are; products that have already been successful, and application of these to own products. Inspiration is quantified with a specific example (hybrid car design). The response is therefore given full marks.

### Exemplar 2

3 marks

Iconic products are product which are well known and distinctive, such as the iPod.

Designers could use iconic products by adapting and improving <sup>them</sup> as well as ~~see~~ seeing why it was successful and applying ~~the~~ that knowledge to their design. [3]

### Examiner commentary

The candidate has defined what is an iconic product using an example, spoke about using the design and knowledge of what has been successful and making improvements on their own product based on previous experience. They have made more than three valid points, securing the full 3 marks for this response.



## Exemplar 3

**1 mark**

Potential customers may recognise the <sup>inspiration</sup> ~~last~~ from iconic design and they may want to buy the new inspired product. They may also do this to prevent copyright as legal action would be taken otherwise. [3]

### Examiner commentary

This candidate has only identified a limit valid point; using the design and taking items of the design to attract potential customers to buy. This response was given 1 mark overall.

## Exemplar 4

**1 mark**

They ~~may~~ might look at other products to see what went well and see if anything can be improved or changed to the product. [3]

### Examiner commentary

This response is given 1 mark for suggesting looking at what went well with an iconic product and making improvements.

## Question 6(a)

6 Fig. 3 shows a vacuum cleaner.

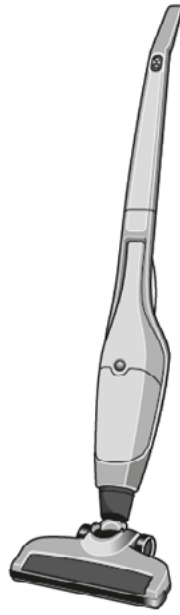


Fig. 3

(a) State **three** ways that the vacuum cleaner in Fig. 3 could be designed for maintenance.

[3]

### Exemplar 1

2 marks

1. could be quick and easy to clean out.
2. could be bit smaller and slimmer  
\* so it's easy to put in places <sup>so easier</sup> to store.
3. Could have detachable parts  
so it would be easy to put  
<sup>away</sup> ~~also~~ <sup>parts</sup> ~~also~~ this would mean you could have more <sup>parts</sup> ~~parts~~ <sup>surfaces</sup> ~~areas~~ <sup>areas</sup> to clean different <sup>surfaces</sup> ~~areas~~ <sup>areas</sup>.

### Examiner commentary

This response has two valid points and was given 2 marks. Being easy to clean out will help with maintenance as the product can be kept in serviceable condition, while detachable parts allow for users to maintain these parts i.e. should a blockage occur this could be removed.

**Exemplar 2****3 marks**

- 1 lots of parts are held together with clips or simple locking mechanisms  
easy to use without tools
- 2 it is not just one part so if something breaks it can be easily  
replaced
- 3 ~~the design~~ standard bolts/screws with bearings so no specialist  
tools are needed.

**Examiner commentary**

This candidate has made three valid points, thereby securing the full 3 marks for their response. These are; easy to repair, standard tools can be used for disassembly, and easily replaceable parts. While all three answers are closely linked there is sufficient difference between them for 3 marks to be given.

**Exemplar 3****3 marks**

- 1 ~~long~~ battery life & made with  
screws keeping it together
- 2 ~~light weight~~ can be cleaned out  
easily.
- 3 easy to disassemble so can just have  
certain bits replaced

**Examiner commentary**

In this response, three valid points are made securing the full 3 marks. The points made are; made using screws (so can be disassembled easily using standard tools), can be easily cleaned and easy to disassemble and replace parts.

While technical terminology has not been used in the response, all three points are valid and distinct.

**Exemplar 4****3 marks**

- 1 easy to access ~~the~~ filter so it can be cleaned regularly.
- 2 standard components allow for easy repairs and replacements.
- 3 ~~detachable~~ detachable accessories mean the product is easy to take apart and maintain. [3]

**Examiner commentary**

This candidate has made three distinct and valid points relating to maintenance and so is given the full 3 marks. The points they make are; easy access to filter, use of standard components allowing easy replacement and detachable components.

**Exemplar 5****1 mark**

- 1 you would be able to <sup>take off</sup> ~~switch~~ the vacuumer part of the vacuum off for easier cleaning.
- 2 you can take the bag that holds the dirt out of the vacuum for easier disposal <sup>of</sup> and cleaning.
- 3 you can remove the outer plastic or metal to clean the tube that dirt travels in easier.

**Examiner commentary**

While this candidate has made three separate points, they are effectively a repetition that the parts can be taken off the vacuum cleaner to maintain them. This response was therefore only given 1 mark in total, due to this repetition.

## Question 6(b)

(b) Explain how maintenance can contribute to sustainable design.

.....

.....

.....

..... [3]

### Exemplar 1

0 marks

It may contribute by the materials used in the product and the power source it comes from. If it is a renewable source it's sustainable. [3]

### Examiner commentary

The response provided by this candidate does not relate to maintenance and helping the product be sustainable. The candidate has incorrectly interpreted the question as how to make a product sustainable, with no mention of maintenance. The response therefore secures no marks.

### Exemplar 2

2 marks

If your product is easy to maintain it will increase the life span as you will not have to throw it away if something breaks. [3]

### Examiner commentary

Marks were given for this response for the link to increasing the life span of the product and for it being easy to maintain meaning it can be repaired if broken and so not thrown away. The response was given 2 marks in total.

**Exemplar 3****3 marks**

If a product is easily maintainable then it will last longer which means the consumer will buy less in that same amount of time and so dispose of less. This is sustainable because it means less materials are being used and wasted. [3]

**Examiner commentary**

This response is given the full 3 marks available. The candidate has identified that with maintenance the product can last longer leading to consumers purchasing less products therefore less materials used and wasted.

**Question 6(c)(i)**

(c) New production processes can impact on the design of new products.

(i) Give **one** example of a new production process.

..... [1]

**Exemplar 1****0 marks**

injection moulding. [1]

**Examiner commentary**

While this candidate has named a process, it is not a new process so is given no marks.

**Exemplar 2****1 mark**

Using robots to automate production [1]

**Examiner commentary**

Robotic production is classed as a new process, and so this candidate scores 1 mark for this response.

## Question 6(c)(ii)

(ii) Give **three** advantages of the new production process in your example given to part (i).

[3]

### Exemplar 1

3 marks

1 Lower labour costs as less ~~staffs~~ labour is required

2 Faster

3 Less likely that a fault ~~it~~ will happen  
and a product will ~~be~~ <sup>be</sup> faulty.

[3]

### Examiner commentary

This candidate has made three valid points linking advantages to robotic production of products, and so is given the full 3 marks.

### Exemplar 2

3 marks

1 Consistent quality.

2 No risk of human error.

3 Tolerances are met consistently.

### Examiner commentary

In this response the candidate has made three clear distinct advantages to automation, thereby securing the full 3 marks available for this question.

## Exemplar 3

**0 marks**

- 1 Cheap
- 2 low labour amount
- 3 quick to make products.

### Examiner commentary

In their previous response to (c)(i) this candidate incorrectly identified 'constant production' as an example of a new production process. Nevertheless, (c)(ii) is marked independently of this.

In the response to (c)(ii) while the candidate has made three separate points, these have not been quantified. Cheap to produce, low labour amount and quick to make all need to be quantified to secure marks (e.g. low labour amount relates to low wage costs). The response overall therefore secures no marks.



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