Learning Objective:
Understand the design cycle and the relationship between design briefs and design specifications

D *Demonstrate a detailed knowledge of the design cycle and the difference between a design brief and specification.*

M *Demonstrate a some knowledge of the design cycle and the difference between a design brief and specification.*

P *Demonstrate a limited knowledge of the design cycle and the difference between a design brief and specification.*

R105

LO1: The Design Cycle
Identify, Design , Optimise and Validation Phase

IDENTIFY PHASE

Section A

Explaining Connectives

So, due to, therefore, as a result, because, consequently, hence, however, furthermore, thus, yet, although, if, expect, unless, apart from, as long as

Explain

state the reasons or justification for something, say how and why something occurred. Give evidence to explain a particular statement.

Detailed:

Point-by-point consideration (e.g. analysis, argument)

Section B

THE DESIGN CYCLE

The Design Cycle is the process a Designer goes through to create a product. Once they reach the evaluate stage, designers can return to identify, to correct any issues they found in the testing and evaluation stages.

Designers will also use The Design Cycle as structure to make sure designs are thoroughly **developed** and **reviewed** at each stage, and allows the designers to discuss the design with client at regular stages.

IDENTIFY PHASE

Designers will often start the design process, with a **design problem**, this is something they have to solve.

A **Design Brief** is a ***statement of how you are going to solve the Design Problem***.
This will usefully include information you know, and anything unknown is then investigated using research.
Design Briefs will usually include; any limitations or constraints, the Target Market, the product, materials and manufacturing processes.

Once the Brief has been created, areas of research are identified.
A Designer can use various methods in order to find out information, including; **interviews, product analysis, market research, reading books, etc.**
Client feedback is also critical at this stage; their requirements and limitations need to be met in order to create a successful product.
A **client** could be another **business** but the **user** could be the intended **target market**

Research findings and client feedback can be used to create a **process plan.** This plan will often include a **production budget, timeline, and what processes, materials and components** will be required to successfully create the final product.

Section C

Keywords & Terms:
Identify: *Brief, Research, Process Planning*
Design: *Specification, Design, Manufacturing Plan*
Optimise: *Prototype, Error Proofing*
Validate: *Test, Evaluate*

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DESIGN PHASE

Section A

A **Design Specification** is a ***list of requirements your product has to meet in order to be successful.***

This list of requirements has been developed from **analysing research findings**, and gives the designer criteria to meet when designing. This **specification** is also useful when evaluating the final product.

Section B

Once the Specification has been developed, the designing of the product will begin. Often a team will work together, not just of designers, but of different branches of a company e.g. lawyers, advertisers, manufactures, accountants, so that all of the aspects of the business are considered.

This will help with starting points and mind mapping ideas and directions. Different considerations will also be taken into account, including; **Anthropometrics, Ergonomics, Features, Competitiveness, etc.**

A designer (and their team) will firstly create **free-hand sketches** to quickly get ideas down onto paper. These ideas are often in **large quantities**, and once a few are selected, those are then developed further and looked at in more detail.

Design → Specification → Design → Manufacturing Plan

Section C

A Final Design is then created. This is often detailed and can be refined on a piece of **CAD software (Computer Aided Design),** like Autodesk or Photoshop. Once this design has been approved by the team, team leader and client, it is then developed into an **Engineering Drawing**

Engineering Drawings are to show the **manufacturers** the **precise measurements** and **parts** of the full product. There can be multiple engineering drawings for a product if it is very complicated.

Once the final design has been chosen, a **Manufacturing Plan** is then created. This sets out all the information about the stages of production. Including; **preparation, processing, assembly, finishing and packaging**. This manufacturing plan will also include, **the timeline, budget, material sources and preparation, as well as manufacturing processes, sizes and Standard Components**

Prototyping is the creation of a **model or "mock-up"** of a product after the Design Process. For example, Dyson famously made 5,127 prototypes before releasing his first vacuum cleaner!

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OPTIMISE PHASE

Section A

Prototyping is useful because it can check if the materials and manufacturing processes would be suitable/available for the product.

You can also gain **customer/ client** feedback on the product, as well as comparing the product to the design brief and specification to see if it meets the requirements it needs to in order to be successful.

If the prototype shows any issues, this allows the designer to change the designs. Prototypes can be made using modelling materials, as well as 3D CAD Software

Section B

Error Proofing is ensuring that the product cannot be assembled or used in an incorrect way (helpful to both manufacturers as well as customers). This can be done by ensuring parts as are few as possible, parts can only be put together a certain way and giving clear indications/ instructions for parts.

A good example of Error Proofing is the sockets on the back of a TV or side of a computer. The sockets are often colour coded and labelled to match the cables, and the cables/ components can only be put in a certain way that works. They can't be used incorrectly.

Section A

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VALIDATE PHASE

There are numerous ways of testing a product. Including:

- Weight/dimension checks
- Chemical Checks
- Visual Checks
- Destructive Testing/ Strength Testing
- User Group Testing
- Temperature Testing
- Operational/Function Testing
- Client Evaluation
- Product Analysis/Comparison

Section B

Sometimes Companies, won't just test and evaluate products themselves – they'll also get independent groups to it, like **Which?** This is also reassuring for customers, as they can read unbiased reviews of products and compare between multiple companies

Testing and Evaluation happens because designers need to ensure the product is successful before being released, and is competitive with the market. They must also ensure it is safe to use, meeting standards and legal requirements, as law suits and potential criminal charges would be severe if a customer was harmed using their product. Also, any other imperfections can be identified and The Design Cycle can be repeated in order to improve the product.