

# Cambridge Nationals Level 1/2

## Engineering Design

### OCR J822

#### Unit R038:

#### Principles of engineering design

## Revision Checklist

Exam Date:	
Exam Time:	
Exam Duration:	1 hour 15 minutes

<b>External Assessment [Written Examination]</b>
<b>70 Marks</b>
<b>Topic Areas to be assessed:</b> <b>1:</b> Designing processes <b>2:</b> Design requirements <b>3:</b> Communicating design outcomes <b>4:</b> Evaluating design ideas
<b>Performance Objectives to be assessed:</b> <b>PO1:</b> Recall knowledge and show understanding <b>PO2:</b> Apply knowledge and understanding <b>PO3:</b> Analyse and evaluate knowledge, understanding and performance



# REVISION TIPS

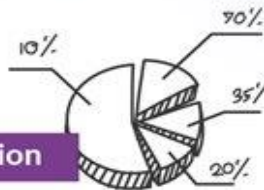


With exam season just on the horizon, you may start to feel a growing sense of anxiety as you begin to tackle your revision pile! Here at [The Training Room](#), we recognise that your success during the exam period depends largely on how well you prepare, this is why we've put together some revision tips to help you achieve the results you want during this exam period!



## Get a headstart on revision

The best way to prepare for the exam period is by getting a head start on your revision. By making a head start on your revision you can benefit from practising past papers, creating a timetable around your life and even enjoying much-needed breaks, all of which helps minimise pre-exam anxiety.



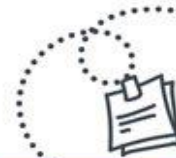
## Get the blood going

Physical activity during the exam period can play an important role in increasing productivity! By doing things like going for a run, heading to the gym or even going for a brisk walk you can stay mentally fresh and ready for the big day!



## Find your spot

Find a revision spot that works for you! A great tip for success during the exam period is to find a spot which enables you to revise comfortably without distractions. It can be your bedroom, the local library or even a spot in your school, just remember the lesser the distractions the better!



## Put notes around your house

Place notes around your house to help you with revision. It might sound silly but sticking notes around your house in places like the living room, the kitchen or even the toilet, will help you remember things and keep them fresh in your mind.



## Get the right snacks

During the exam period it can be quite easy to fall into bad habits with your eating, especially when it comes to snacks, so if you're going to snack, snack right! By eating healthy snacks such as vegetables and fruits to oily fish you can keep your brain going for longer through good nutrients!



## Do it your awesome way

At the end of the day, everyone has their own way of learning when it comes to revising during the exam period, this is why you should take the time you understanding your way of learning! Not only will this make it easier for you to study it will also help you recall information in the long run.



## Think positive!

Think positive during the exam season as it can go a long way in helping reduce stress and anxiety, all of which helps with feeling relaxed on the day! Often overlooked, for us thinking positive during the exam period is a great way to put yourself in the right frame of mind.



## R038 Examination Command Words

Word(s)	Students will...
<b>Analyse</b>	<ul style="list-style-type: none"> <li>▪ Separate or break down information into parts and identify their characteristics or elements</li> <li>▪ Explain the pros and cons of a topic or argument and make reasoned comments</li> <li>▪ Explain the impacts of actions using a logical chain of reasoning</li> </ul>
<b>Annotate</b>	<ul style="list-style-type: none"> <li>▪ Add information, for example, to a table, diagram or graph until it is final</li> <li>▪ Add all the needed or appropriate parts</li> </ul>
<b>Calculate</b>	<ul style="list-style-type: none"> <li>▪ Get a numerical answer showing how it has been worked out</li> </ul>
<b>Choose</b>	<ul style="list-style-type: none"> <li>▪ Select an answer from options give</li> </ul>
<b>Circle</b>	<ul style="list-style-type: none"> <li>▪ Select an answer from options given</li> </ul>
<b>Compare and contrast</b>	<ul style="list-style-type: none"> <li>▪ Give an account of the similarities and differences between two or more items or situations</li> </ul>
<b>Complete</b>	<ul style="list-style-type: none"> <li>▪ Add all the needed or appropriate parts</li> <li>▪ Add information, for example, to a table, diagram or graph until it is final</li> </ul>
<b>Create</b>	<ul style="list-style-type: none"> <li>▪ Produce a visual solution to a problem (for example: a mind map, flowchart or visualisation)</li> </ul>
<b>Describe</b>	<ul style="list-style-type: none"> <li>▪ Give an account including all the relevant characteristics, qualities or events</li> <li>▪ Give a detailed account of</li> </ul>
<b>Discuss</b>	<ul style="list-style-type: none"> <li>▪ Present, analyse and evaluate relevant points (for example, for/against an argument)</li> </ul>
<b>Draw</b>	<ul style="list-style-type: none"> <li>▪ Produce a picture or diagram</li> </ul>
<b>Evaluate</b>	<ul style="list-style-type: none"> <li>▪ Make a reasoned qualitative judgement considering different factors and using available knowledge/experience</li> </ul>
<b>Explain</b>	<ul style="list-style-type: none"> <li>▪ Give reasons for and/or causes of</li> <li>▪ Use the words or phrases such as 'because' or 'therefore' or 'this means that' in answers</li> </ul>
<b>Fill in</b>	<ul style="list-style-type: none"> <li>▪ Add all the needed or appropriate parts</li> <li>▪ Add information, for example, to a table, diagram or graph until it is final</li> </ul>
<b>Identify</b>	<ul style="list-style-type: none"> <li>▪ Select an answer from options given</li> <li>▪ Recognise, name or provide factors or features</li> </ul>
<b>Justify</b>	<ul style="list-style-type: none"> <li>▪ Give good reasons for offering an opinion or reaching a conclusion</li> </ul>
<b>Label</b>	<ul style="list-style-type: none"> <li>▪ Add information, for example, to a table, diagram or graph until it is final</li> <li>▪ Add all the necessary or appropriate parts</li> </ul>
<b>Outline</b>	<ul style="list-style-type: none"> <li>▪ Give a short account, summary or description</li> </ul>
<b>State</b>	<ul style="list-style-type: none"> <li>▪ Give factors or features</li> <li>▪ Give short, factual answers</li> </ul>

### Topic Revised Key:

<b>D</b>	Developing
<b>S</b>	Secure
<b>M</b>	Mastered

## TA1: Designing processes

TA	Topic	D	S	M
<b>1.1.</b>	<b>The stages involved in design strategies</b>			
	Know the <b>stages</b> involved in <b>design strategies</b>			
	<b>Linear design:</b> The context in which it might be applied			
	Linear design: Advantages			
	Linear design: Disadvantages			
	<b>Iterative design:</b> The context in which it might be applied			
	Iterative design: Advantages			
	Iterative design: Disadvantages			
	<b>Inclusive design:</b> The context in which it might be applied			
	Inclusive design: Advantages			
	Inclusive design: Disadvantages			
	<b>User-centred design:</b> The context in which it might be applied			
	User-centred design: Advantages			
	User-centred design: Disadvantages			
	<b>Sustainable design:</b> The context in which it might be applied			
	Sustainable design: Advantages			
	Sustainable design: Disadvantages			
	<b>Ergonomic design:</b> The context in which it might be applied			
Ergonomic design: Advantages				
Ergonomic design: Disadvantages				
<b>1.2.</b>	<b>Stages of the iterative design process, and the activities carried out within each stage of this cyclic approach</b>			
<b>1.2.1.</b>	<b>Design</b>			
	<b>Analysis</b> of the <b>design brief</b>			
	Methods of <b>researching</b> the product requirements			
	<b>Primary research:</b> Types of information obtained			
	Primary research: Advantages			
	Primary research: Disadvantages			
	Primary research: How it contributes to the design process			
	<b>Secondary research:</b> Types of information obtained			
	Secondary research: Advantages			
	Secondary research: Disadvantages			
	Secondary research: How it contributes to the design process			
	<b>Market research to determine existing products:</b> How it contributes to the design process			
	<b>Interviews with potential users and focus groups:</b> How it contributes to the design process			
	<b>Use of tables of anthropometric data:</b> How it contributes to the design process			
	<b>Analysis of existing products using ACCESS FM:</b> How it contributes to the design process			
	<b>Analysis of existing products using product disassembly:</b> How it contributes to the design process			
	<b>Production</b> of an engineering design specification			
	<b>Generation</b> of design ideas by sketching and modelling			
<b>1.2.2.</b>	<b>Make and evaluate</b>			
	The reasons for the use of <b>modelling</b>			
	<b>Virtual modelling of the design idea:</b> How to make			
	Virtual modelling of the design idea: How to evaluate			
	<b>Physical modelling of the design idea:</b> How to make			
Physical modelling of the design idea: How to evaluate				

	<b>Manufacture or modification of the prototype:</b> How to make/modify			
	Manufacture or modification of the prototype: How to evaluate			

## TA2: Design requirements

TA	Topic	D	S	M
2.1.	<b>Types of criteria included in an engineering design specification</b>			
	The <b>difference</b> between <b>needs and wants</b>			
	The <b>difference</b> between <b>quantitative data and qualitative data</b>			
	Reasons for the <b>product criteria</b> included in the design specification (ACCESS FM)			
2.2.	<b>How manufacturing considerations affect design</b>			
	How <b>scale of manufacture considerations</b> affect design			
	How <b>material availability and form considerations</b> affect design			
	How <b>types of manufacturing processes considerations</b> affect design			
	How <b>production costs considerations</b> affect design			
	Typical products manufactured at <b>different scales</b> of manufacture			
2.3.	<b>Influences on engineering product design</b>			
	How <b>market</b> pull and <b>technology</b> push influences engineering product design			
	Know the <b>purpose</b> of the quality standard <b>British Standards (BS)</b>			
	Know the <b>purpose</b> of the quality standard <b>United Kingdom Conformity Assessed (UKCA)</b>			
	How British and International Standards <b>influences</b> engineering product design			
	Know the <b>legislation</b> related to health and safety regulation and risk assessment			
	How legislation <b>influences</b> engineering product design			
	How <b>planned obsolescence</b> influences engineering product design			
	Know the <b>6Rs of sustainable design</b>			
	How sustainable design (6Rs) <b>influences</b> engineering product design			
How design for the <b>circular economy</b> influences engineering product design				

## TA3: Communicating design outcomes

TA	Topic	D	S	M
<b>3.1.</b>	<b>Types of drawing used in engineering</b>			
	Know the <b>types of drawing</b> used in engineering			
	<b>Freehand sketching:</b> Applications			
	Freehand sketching: Advantages			
	Freehand sketching: Disadvantages			
	<b>Isometric:</b> Applications			
	Isometric: Advantages			
	Isometric: Disadvantages			
	<b>Oblique:</b> Applications			
	Oblique: Advantages			
	Oblique: Disadvantages			
	<b>Orthographic drawings:</b> Applications			
	Orthographic drawings: Advantages			
	Orthographic drawings: Disadvantages			
	<b>Exploded views:</b> Applications			
	Exploded views: Advantages			
	Exploded views: Disadvantages			
	<b>Assembly drawings:</b> Applications			
	Assembly drawings: Advantages			
	Assembly drawings: Disadvantages			
	<b>Block diagrams:</b> Applications			
	Block diagrams: Advantages			
	Block diagrams: Disadvantages			
	<b>Flowcharts:</b> Applications			
	Flowcharts: Advantages			
	Flowcharts: Disadvantages			
<b>Circuit diagrams:</b> Applications				
Circuit diagrams: Advantages				
Circuit diagrams: Disadvantages				
<b>Wiring diagrams:</b> Applications				
Wiring diagrams: Advantages				
Wiring diagrams: Disadvantages				
<b>3.2.</b>	<b>Working drawings</b>			
	How <b>2D engineering</b> drawings using third angle orthographic projection are used in working drawings			
	How <b>standard conventions</b> are used in working drawings			
	Know the standard conventions for <b>dimensions</b> used in working drawings			
	Know the <b>types of line types</b> used in working drawings			
	<b>Outlines:</b> Meaning			
	<b>Hidden detail:</b> Meaning			
	<b>Centre line:</b> Meaning			
	<b>Projection:</b> Meaning			
	<b>Dimension:</b> Meaning			
	<b>Leader line:</b> Meaning			
	Know the <b>abbreviations</b> for working drawings			
	Know the <b>representations</b> of mechanical features			
Know the <b>standard conventions in BS 8888</b> and how these are <b>applied</b>				
<b>3.3.</b>	<b>Using CAD drawing software</b>			
	<b>Advantages</b> of using CAD drawing software compared to manual drawing techniques			
	<b>Limitations</b> of using CAD drawing software compared to manual drawing techniques			



## TA4: Evaluating design ideas

TA	Topic	D	S	M
<b>4.1.</b>	<b>Methods of evaluating design ideas</b>			
	Know the <b>different</b> methods of <b>evaluating design ideas</b>			
	<b>Production of models:</b> Purpose			
	<b>Qualitative comparison with the design brief and specification:</b> Purpose			
	<b>Ranking matrices:</b> Purpose			
	<b>Quality Function Deployment (QFD):</b> Purpose			
<b>4.2.</b>	<b>Modelling methods</b>			
	Know the <b>different modelling methods</b>			
	<b>Virtual (3D CAD):</b> The type of information that can be obtained			
	Virtual (3D CAD): The equipment required			
	Virtual (3D CAD): Stages involved			
	Virtual (3D CAD): Advantages			
	Virtual (3D CAD): Limitations			
	<b>Card:</b> The type of information that can be obtained			
	Card: The equipment required			
	Card: Stages involved			
	Card: Advantages			
	Card: Limitations			
	<b>Block:</b> The type of information that can be obtained			
	Block: The equipment required			
	Block: Stages involved			
	Block: Advantages			
	Block: Limitations			
	<b>Breadboarding:</b> The type of information that can be obtained			
	Breadboarding: The equipment required			
	Breadboarding: Stages involved			
	Breadboarding: Advantages			
	Breadboarding: Limitations			
	<b>3D printing:</b> The type of information that can be obtained			
	3D printing: The equipment required			
	3D printing: Stages involved			
	3D printing: Advantages			
3D printing: Limitations				
<b>4.3.</b>	<b>Methods of evaluating a design outcome</b>			
	Know the <b>methods</b> of <b>evaluating a design outcome</b>			
	<b>Methods of measuring the dimensions and functionality of the product:</b> Advantages			
	Methods of measuring the dimensions and functionality of the product: Limitations			
	<b>Quantitative comparison with the design brief and specification:</b> Advantages			
	Quantitative comparison with the design brief and specification: Limitations			
	<b>User testing:</b> Advantages			
	User testing: Limitations			
Reasons for <b>identifying potential modifications and improvements</b> to the design				