

# **Level 2 Technical Award in Engineering (1145-20)**

**[SAMPLE]**

**Synoptic Assignment Pack**

# Introduction

General information about structure of the assignment pack

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- Assignment and tasks

Tutor section

- Guidance on tasks
- Guidance on assessment conditions
- Guidance on marking
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## Candidate section

### Candidate guidance

This is a formal assessment that you will be marked and graded on. You will be marked on the quality and accuracy of your practical performance and any written work you produce. It is therefore important that you carry your work out to the highest standard you can. You should show how well you know and understand the subject and how you are able to use your knowledge and skills together to complete the tasks.

#### Plagiarism

Plagiarism is the failure to acknowledge sources properly and/or the submission of another person's work as if it were the candidate's own. Plagiarism is not allowed in this assignment.

This is an assessment of your abilities, so the work must be all your own work and carried out under the conditions stated. You will be asked to sign a declaration that you have not had any outside help with the assessment.

Your tutor is allowed to give you some help understanding the assignment instructions if necessary, but they will record any other guidance you need and this will be taken into account during marking.

Where research is allowed, your tutor must be able to identify which work you have done yourself, and what you have found from other sources. It is therefore important to make sure you acknowledge all sources and clearly reference any information taken from them.

#### Timings and planning

You should take care when planning to make sure you have divided the time available between tasks appropriately. You should check your plan is appropriate with your tutor.

If you have a good reason for needing more time, you will need to explain the reasons to your tutor and agree a new deadline date. Changes to dates will be at the discretion of the tutor, and they may not mark work that is handed in after the agreed deadlines.

#### Health and Safety

You must always work safely, in particular while you are carrying out practical tasks.

You must always follow any relevant health and safety regulations and codes of practice.

If your tutor sees you working in a way that is unsafe for yourself or others, they will ask you to stop immediately, and tell you why. Your tutor will not be able to allow you to continue until they are sure you are ready for assessment and can work safely

#### Presentation of work

Presentation of work must be neat and appropriate to the task.

You should make sure that each piece of work is clearly labelled with your name and the assignment reference.

All electronic files must be given a clear file name that allows your tutor to identify it as your work.

The use of non-programmable scientific calculators is acceptable.

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## Assignment

Building Energy Management Systems (BEMS) are computer-based systems that help to manage, control and monitor modern building services such as air conditioning, heating and lighting. They also manage the energy consumption of devices used by the building.

Light level sensors are a key part of BEMS and are designed to control light levels of artificial lighting in order to achieve energy efficiency.

A local company manufactures BEMS components but doesn't manufacture the light level sensor unit. They are planning to bring production of these in-house. An outline design and specification has been produced for this light level sensor. These are in Appendix A.

You have been asked to

- interpret the outline design and specification for the light level sensor unit
- develop it through its prototyping stage to prove the design works before it is approved for manufacture.

## Tasks

### Task 1

You are required to complete the electrical circuit schematic for the electronic aspects of the light level sensor unit to fully represent all information needed to produce a prototype.

You are required to produce orthographic drawings of the lid and the base of the mechanical enclosure of the light level sensor unit that includes all relevant information needed to produce a prototype.

These drawings can be hand-drawn or produced using computer software.

#### Conditions of assessment:

You must carry the task out on your own, under supervised conditions.

#### What must be presented for marking:

- Completed electronic circuit schematic for light level sensor unit
- Orthographic drawing of the lid of the light level sensor unit
- Orthographic drawing of the base of the light level sensor unit.

### Task 2

You are required to use CAD to produce a virtual model of the assembly of the base and lid for the light level sensor unit.

You are required to use CAD to simulate the light level sensor unit's electronic circuit functionality and performance.

Produce a summary of your findings from the modelling.

#### Conditions of assessment:

You must carry the task out on your own, under supervised conditions.

#### What must be presented for marking:

- CAD image files of light level sensor unit base and lid assembly
- CAD image files of electronic simulation
- Summary of findings. This can be a short reflective report or annotations on the image files.

### Task 3

You are required to produce a physical prototype (both mechanical and electronic) of the full light level sensor unit.

You are required to measure its performance against the original design specification.

#### Conditions of assessment:

You must carry the tasks out on your own, under supervised conditions.

#### What must be presented for marking:

- Assembled prototype
- Test and measurement results
- Photographs of your completed work, including any component parts.

#### **Task 4**

You are required to evaluate the success of the prototype against the original design specification, including the processes used for its development.

You are required to recommend how the prototype and/or design should be amended to meet the design specification in order to support the next steps of the commercial manufacture of the light level sensor unit.

#### **Conditions of assessment:**

You must carry the task out on your own, under supervised conditions.

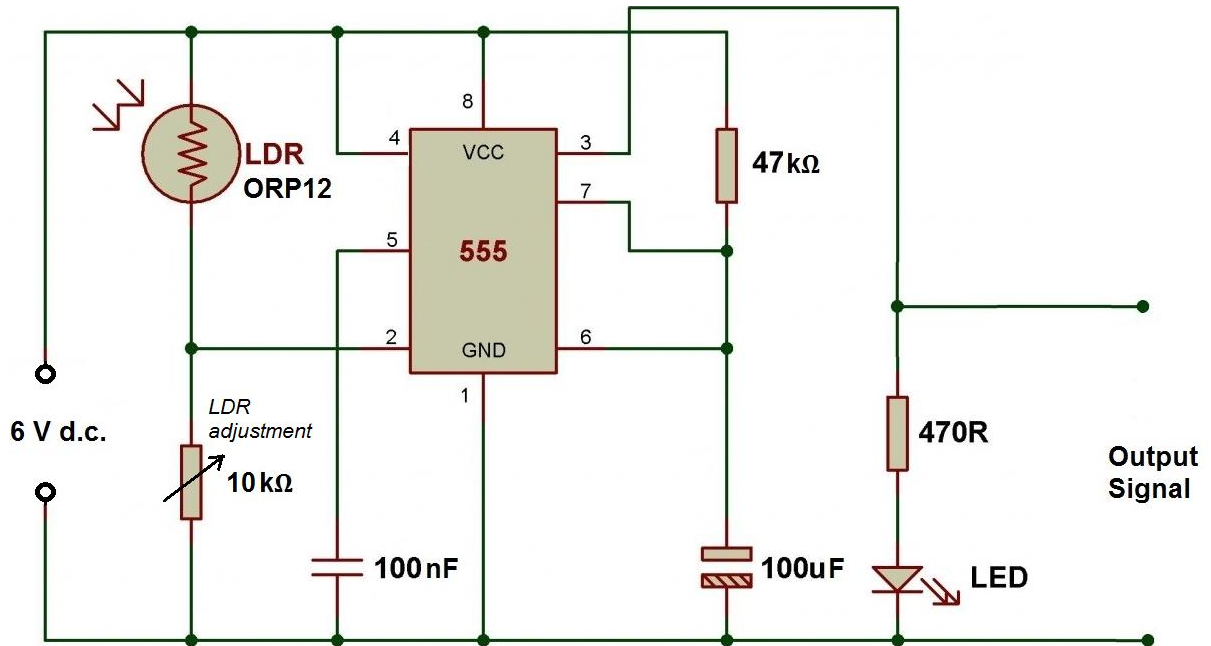
#### **What must be presented for marking:**

- Evaluation report
- Your tutor's notes of your working practice, the standard and accuracy of the finished work.

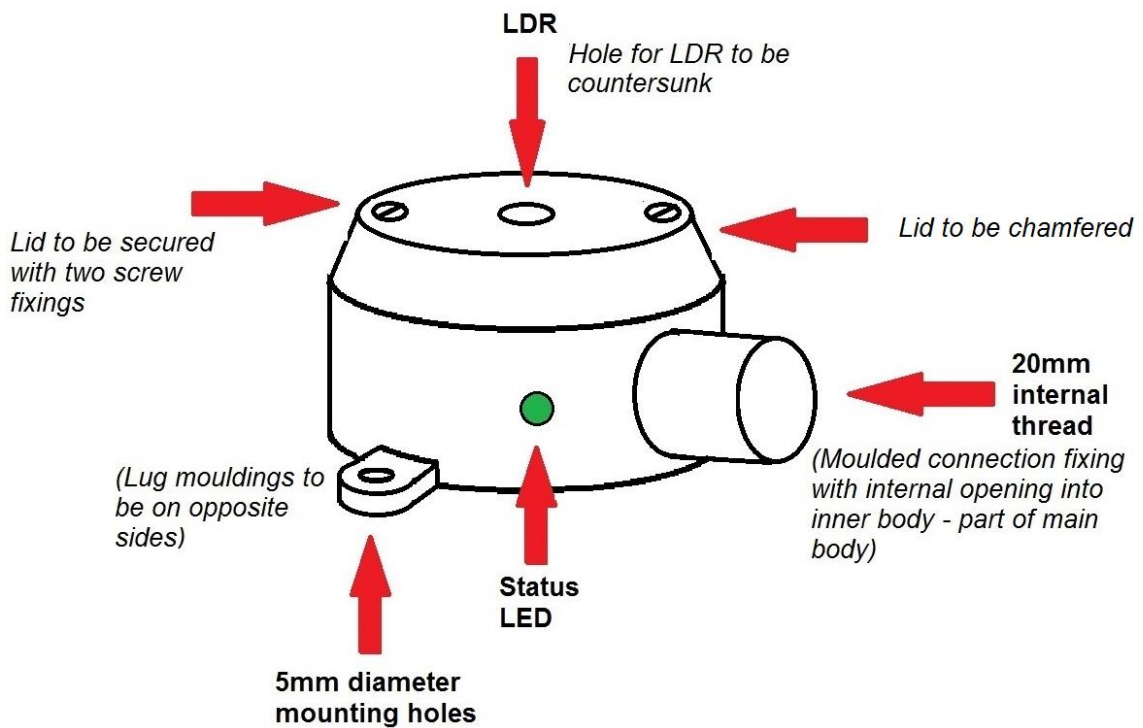
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APPENDIX A

Electronic Circuit Schematic



Sketch of Mechanical Lid and Base





## **SUGGESTED SPECIFICATION**

- Will have a d.c. output of 0V when low and 4.3 V when high to interface to BEMS
- Will have output signal and power supply fed through a multicore cable
- Will have the variable resistor set at 4.7 k $\Omega$
- Will have 555 timer fitted in a DIL socket
- Will be wall mounted with lugs with holes of 5mm diameter
- Will have a M20 x 1.5mm female thread for cable entry
- Will have PCB fixed on 6mm spacers attached to the base
- Will have a chamfer on the lid at 45°
- Will have a countersunk hole for LDR at 90°
- Will have no sharp edges on final product
- Will function when outside in typical UK climate conditions.

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## Tutor guidance

This synoptic assessment is designed to require the candidate to make use their knowledge, understanding and skills they have built up over the course of their learning to tackle problems/tasks/challenges.

This approach to assessment emphasises to candidates the importance and applicability of the full range of their learning to practice in their industry area, and supports them in learning to take responsibility for transferring their knowledge, understanding and skills to the practical situation, fostering independence, autonomy and confidence.

Candidates are provided with a set of tasks. They then have to draw on their knowledge and skills and independently select the correct processes, skills, materials, and approaches to take.

During the learning programme, it is expected that tutors will have taken the opportunity to set shorter, formative tasks that allow candidates to be supported to independently use the learning they have so far covered, drawing this together in a similar way, so they are familiar with the format, conditions and expectations of the synoptic assessment.

You should explain to candidates what the Assessment Objectives are and how they are implemented in marking the assignment, so they will understand the level of performance that will achieve them high marks.

The candidate should not be entered for the assessment until the end of the course of learning for the qualification so they are in a position to complete the assignment successfully.

## Guidance on tasks

### Time

The recommended time allocated for the completion of the tasks and production of evidence for this assessment is between **12 - 16 hours**. Candidates should be required to plan their work and have their plans confirmed for appropriateness in relation to the time allocated for each task.

### Resources

Candidates must have access to a suitable range of resources to carry out the tasks, for example:

- CAD software (design and simulation)
- Side cutters
- Screwdrivers
- Snipe nose pliers
- Soldering iron
- PCB board holder
- d.c. power supply
- PCB etch tanks
- Pillar drill
- 3D printer
- Component data sheets.

### Health and safety

Candidates should not be entered for assessment without being clear of the importance of working safely, and practice of doing so. The tutor must immediately stop an assessment if a candidate works unsafely. At the discretion of the tutor, depending on the severity of the incident, the candidate may be given a warning. If they continue to work unsafely however, their assessment must be ended and they must retake the assessment at a later date.

### Observation

Where the tutor is required to carry out observation of performance, detailed notes must be taken of the quality of performance along with any other aspects of performance that will support a judgement of the marks to be awarded (eg measurements to confirm accuracy/tolerances).

The tutor should refer to the grading criteria to ensure appropriate aspects of performance are recorded. These notes will be used for moderation purposes and must be detailed and accurate. Tutors should ensure that any supporting evidence including photographs or video can be easily matched to the correct candidate, are clear, sufficiently well-lit and showing the areas of particular interest for assessment (ie taken at appropriate points in production, showing accuracy of measurements where appropriate).

If candidates are required to work as a team, each candidate's contribution must be noted separately. The tutor may intervene if any individual candidate's contribution is unclear or to ensure fair access (see below).

### Preparation

Candidates should be aware of which aspects of their performance will give them good marks in assessment. This is best carried out through routinely pointing out good or poor performance during the learning period, and through formative assessment. Candidates should be encouraged

to do the best they can and be made aware of the difference between these summative assessments and any formative assessments they have been subject to. Learners must not have access to the marking grids.

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## Guidance on assessment conditions

The assessment conditions that are in place for this synoptic assignment are to:

- ensure the rigour of the assessment process
- provide fairness for candidates
- give confidence in the outcome.

They can be thought of as the rules that ensure that all candidates who take an assessment are being treated fairly, equally and in a manner that ensures their result reflects their true ability.

The conditions outlined below relate to this summative synoptic assignment. These do not affect any formative assessment work that takes place. Formative assessment will necessarily take a significant role throughout the learning programme where support, guidance and feedback (with the opportunity to show how feedback has been used to improve outcomes and learning) are critical. This approach is not, however, valid for summative assessment. The purpose of summative assessment is to confirm the standard the candidate has achieved as a result of participating in the learning process.

### Authentication of candidate work

Candidates are required to sign declarations of authenticity, as is the tutor. The relevant form is included in this assignment pack.

The completion of the final evidence for the tasks that make up this synoptic assignment must be completed in the specified conditions. This is to ensure authenticity and prevent malpractice as well as to assess and record candidate performance for assessment in the practical tasks. Any aspect that may be undertaken in unsupervised conditions is specified.

Candidates can rework any evidence that has been produced for this synoptic assignment during the time allowed. However, this must be as a result of their own review and identification of weaknesses and not as a result of tutor feedback. Once the evidence has been submitted for assessment, no further amendments to evidence can be made.

Candidate evidence must be kept secure to prevent unsupervised access by the candidate or others. Where evidence is produced over a number of sessions, the tutor must ensure learners and others cannot access the evidence without supervision. This might include storing written work or artefacts in locked cupboards and collecting memory sticks of evidence produced electronically at the end of each session.

### Accessibility and fairness

Where the candidate has special requirements, tutors should refer to the separate guidance document.

Tutors can provide clarification to any candidate on the requirements of any aspect of this synoptic assignment. Tutors should not provide more guidance than the candidate needs as this may impact on the candidate's grade. Guidance must only support access to the assignment and must not provide feedback for improvement. Any clarification and guidance should be recorded fully and must be taken into account along with the candidate's final evidence during marking and must be made available for moderation. Tutors must not provide feedback on the quality of the performance or how the quality of evidence can be improved. This would be classed as malpractice. Tutors should however provide general reminders to candidates throughout the assessment period that they must check their work thoroughly before submitting it to be sure that they are happy with their final evidence as it may not be worked on further after submission.

It is up to the tutor during marking to decide in what area, if any, the guidance provided suggests the candidate is lacking, the severity of the issue, and how to award marks on the basis of this full range of evidence. The tutor must record where and how guidance has had an impact on the marks given, so this is available should queries arise at moderation or appeal.

**Example:**

A tutor should intervene if a candidate has taken a course of action that will result in them not being able to submit the full range of evidence for assessment. However this should only take place once the tutor has prompted the candidate to check that they have covered all the requirements. Where the tutor has to be explicit as to what the issue is, this is likely to demonstrate a lack of understanding on the part of the candidate rather than a simple error.

The tutor should do their best to refrain from providing guidance if the candidate is thought to be able to correct the issue without it, and a prompt would suffice. In other words only the minimum support the candidate actually needs should be given, since the more guidance provided, the larger the impact on the marks awarded.

Both prompts and details of the nature of any further guidance must be recorded and reviewed during marking and moderation.

A tutor may not provide guidance that the candidate's work is not at the required standard or how to improve their work. In this way, candidates are given the chance to identify and correct any errors on their own, providing valid evidence of knowledge and skills that will be credited during marking.

Tutors should ensure that candidates' plans or completion of the tasks distribute the time available appropriately and may guide candidates on where they should be up to at any point in a general way. Any excessive time taken for any task should be recorded and should be taken into account during marking if appropriate

All candidates must be provided with an environment and resources that allows them access to the full range of marks available.

Where candidates have worked in groups to complete one or more tasks for this synoptic assessment, the tutor must ensure that no candidate is disadvantaged as a result of the performance of any other team member. If a team member is distracting or preventing another team member from fully demonstrating their skills or knowledge, the tutor must intervene.

## Guidance on marking

Please see the centre guidance document ***Guidance for assessment of City & Guilds technical qualifications, including grading and use of marking grids*** for detailed guidance on using the following marking grid.

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## Marking grid:

For any category, 0 marks may be awarded where there is no evidence of worthy achievement.

%	Assessment Objective	Band 1 descriptor Poor to limited	Band 2 descriptor Fair to good	Band 3 descriptor Strong to excellent
0	<b>AO1 Recall of knowledge relating to the qualification LOs</b>	N/A: This AO is assessed through the test.		
25	<b>AO2 Understanding of concepts theories and processes relating to the LOs</b> <ul style="list-style-type: none"> <li>• Does the candidate make connections and show causal links and explain why?</li> <li>• How well theories and concepts are applied to new situations/the assignment?</li> <li>• How well chosen are exemplars – how well do they illustrate the concept?</li> </ul>	<p style="text-align: center;"><b>(0-4 marks)</b></p> <p><b>Some evidence of being able to give explanations of concepts and theories. Explanations appear to be recalled, simplistic or incomplete.</b></p> <p>Misunderstanding, illogical connections, guessing,</p>	<p style="text-align: center;"><b>(5-8 marks)</b></p> <p><b>Explanations are logical. Showing comprehension and generally free from misunderstanding, but may lack depth or connections are incompletely explored.</b></p> <p>Logical, slightly disjointed, plausible,</p>	<p style="text-align: center;"><b>(9-12 marks)</b></p> <p><b>Consistently strong evidence of clear causal links in explanations generated by the candidate. Candidate uses concepts and theories confidently in explaining decisions taken and application to new situations.</b></p> <p>Logical reasoning, thoughtful decisions, causal links, justified</p>
		<p><b>Examples of understanding expected:</b> Relationship between lid and base in virtual model, relationship between base, lid and PCB, electrical components used in the virtual and physical models, addition of components to the schematic, selection of measuring devices, parameters for testing, properties of materials and components, manufacturing processes.</p>		



%	Assessment Objective	Band 1 descriptor Poor to limited	Band 2 descriptor Fair to good	Band 3 descriptor Strong to excellent
		<p><b>Bottom of band:</b> Candidate has shown a basic understanding of some key concepts.</p> <p><b>Top of band:</b> Candidate has shown basic understanding of concepts from across the qualification. Some points were covered in detail.</p>	<p><b>Bottom of band:</b> Candidate has shown understanding of a range of concepts from across the qualification, which were sound and often detailed.</p> <p><b>Top of band:</b> Candidate has shown a broad range of understanding of concepts, making links to practice. Understanding is consistent with reasoning coherent and well explained.</p>	<p><b>Bottom of band:</b> Candidate has shown in-depth and detailed understanding of concepts across the whole qualification range, showing a high degree of confidence and accuracy.</p> <p><b>Top of band:</b> Candidate explanations are clear and strong links have been made between concepts and links to practice. Concepts and understanding were applied consistently and effectively with recommendations.</p>

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%	Assessment Objective	Band 1 descriptor Poor to limited	Band 2 descriptor Fair to good	Band 3 descriptor Strong to excellent
35	<b>AO3 Application of practical/ technical skills</b> <ul style="list-style-type: none"> <li>• How practiced/fluid does hand eye coordination and dexterity seem?</li> <li>• How confidently does the candidate use the breadth of practical skills open to them?</li> </ul>	<p align="center"><b>(0-6 marks)</b></p> <p><b>Some evidence of familiarity with practical skills. Some awkwardness in implementation, may show frustration out of inability rather than lack of care.</b></p> <p>Unable to adapt, frustrated, flaws, out of tolerance, imperfect, clumsy.</p>	<p align="center"><b>(7-12 marks)</b></p> <p><b>Generally successful application of skills, although areas of complexity may present a challenge. Skills are not yet second nature.</b></p> <p>Somewhat successful, some inconsistencies, fairly adept/capable.</p>	<p align="center"><b>(13-18 marks)</b></p> <p><b>Consistently high levels of skill and/or dexterity, showing ability to successfully make adjustments to practice; able to deal successfully with complexity.</b></p> <p>Dextrous, fluid, comes naturally, skilled, practiced.</p>
		<p><b>Examples of skills expected:</b> Degree of accuracy, features of CAD software used effectively, manual dexterity, quality of finish, electrical and mechanical integrity, measuring, testing, health and safety.</p>		

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<ul style="list-style-type: none"> <li>• How accurately/successfully has the candidate been able to use skills/achieve practical outcomes?</li> </ul>	<p><b>Bottom of band:</b> Candidate created outputs some of which were incomplete. May not show full range of skills to complete tasks but was able to work safely at all times.</p> <p><b>Top of band:</b> Candidate demonstrated basic application of technical skills. Created outputs with limited accuracy and interrelationships. Able to obtain some data from tests and to work safely at all times.</p>	<p><b>Bottom of band:</b> Candidate demonstrated application of technical skills to create required outputs which were generally accurate and some interrelationships evident. Able to obtain accurate data from tests and work safely at all times. Demonstrated manual dexterity in the use of tools and materials.</p> <p><b>Top of band:</b> Candidate demonstrated application of technical skills when completing tasks with some inconsistency. Outputs were generally accurate and there was a clear relationship between them. Obtained some valid, reliable and accurate data. Technology and software were used effectively. Able to work safely at all times. Demonstrated manual dexterity in the use of tools and materials and outputs were functional.</p>	<p><b>Bottom of band:</b> Candidate demonstrated consistent application of technical skills. Outputs were accurate, functional and finished to a high standard with clear relationships between them. Obtained valid, reliable and accurate data through appropriate methodologies. Technology and software were used effectively. Showed a high degree of manual dexterity in the use of tools and materials. Able to work safely at all times.</p> <p><b>Top of band:</b> Candidate demonstrated consistent, confident application of technical skills. Outputs were accurate, functional and finished to a professional standard with clear relationships between them. There was effective use of technology and advanced software features. Obtained valid, reliable and accurate data through appropriate methodologies. Showed a high degree of manual</p>
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%	Assessment Objective	Band 1 descriptor Poor to limited	Band 2 descriptor Fair to good	Band 3 descriptor Strong to excellent
				dexterity in the use of tools and materials. Able to work safely at all times.
25	<b>AO4 Bringing it all together - coherence of the whole subject</b> <ul style="list-style-type: none"> <li>Does the candidate draw from the breadth of their knowledge and skills?</li> <li>Does the candidate remember to reflect on theory when solving practical problems?</li> <li>How well can the candidate work out solutions to new contexts/ problems on their own?</li> </ul>	<p style="text-align: center;"><b>(0-4 marks)</b></p> <p><b>Some evidence of consideration of theory when attempting tasks. Tends to attend to single aspects at a time without considering implication of contextual information.</b></p> <p>Some random trial and error, new situations are challenging, expects guidance, narrow. Many need prompting.</p>	<p style="text-align: center;"><b>(5-8 marks)</b></p> <p><b>Shows good application of theory to practice and new context, some inconsistencies.</b></p> <p>Remembers to apply theory, somewhat successful at achieving fitness for purpose. Some consolidation of theory and practice</p>	<p style="text-align: center;"><b>(9-12 marks)</b></p> <p><b>Strong evidence of thorough consideration of the context and use of theory and skills to achieve fitness for purpose.</b></p> <p>Purposeful experimentation, plausible ideas, guided by theory and experience, fit for purpose, integrated, uses whole toolkit of theory and skills.</p>
		<p><b>Examples of bringing it all together:</b> Applying knowledge and understanding across all tasks, justifying recommendations/approaches taken, understanding of electrical and mechanical components in virtual modelling, representation of mechanical features using virtual modelling, interpreting electrical and mechanical drawings to produce physical prototypes, application of understanding of measurement to testing of mechanical and electrical components, application of understanding of material properties and manufacturing processes to the development from a prototype.</p>		

%	Assessment Objective	Band 1 descriptor Poor to limited	Band 2 descriptor Fair to good	Band 3 descriptor Strong to excellent
		<p><b>Bottom of band:</b> Candidate presented some evidence of using their knowledge, understanding and skills to make straightforward links between limited topics across the qualification.</p> <p><b>Top of band:</b> Candidate showed evidence of using their knowledge, understanding and skills to make key links between limited topics across the qualification.</p>	<p><b>Bottom of band:</b> Candidate consistently brought together their knowledge, understanding and skills when developing the prototype. Key links were made between a range of topics from across the qualification.</p> <p><b>Top of band:</b> Candidate used a range of knowledge, understanding and skills from across the qualification when developing and evaluating the prototype. Integration of knowledge, understanding and skills informed development of prototype to commercial manufacture.</p>	<p><b>Bottom of band:</b> Candidates used a wide range of knowledge, understanding and skills from across the qualification when developing and evaluating the prototype. Integration of knowledge, understanding and skills informed recommendations for development of prototype to commercial manufacture.</p> <p><b>Top of band:</b> Candidate used a wide range of knowledge, understanding and skills from across the qualification to develop and evaluate the prototype. Integration of knowledge, understanding and skills informed justified recommendations for development of prototype to commercial manufacture.</p>

%	Assessment Objective	Band 1 descriptor Poor to limited	Band 2 descriptor Fair to good	Band 3 descriptor Strong to excellent
15	<b>A05 Attending to detail/perfecting</b> <ul style="list-style-type: none"> <li>Does the candidate routinely check on quality, finish etc and attend to imperfections/ omissions</li> <li>How much is accuracy a result of persistent care and attention (eg measure twice cut once)?</li> <li>Would you describe the candidate as a perfectionist and wholly engaged in the subject?</li> </ul>	<p align="center"><b>(0-2 marks)</b></p> <p><b>Easily distracted or lack of checking. Insufficiently concerned by poor result; little attempt to improve. Gives up too early; focus may be on completion rather than quality of outcome.</b></p> <p>Careless, imprecise, flawed, uncaring, unfocussed, unobservant, unmotivated.</p>	<p align="center"><b>(3-4 marks)</b></p> <p><b>Aims for satisfactory result but may not persist beyond this. Uses feedback methods but perhaps not fully or consistently.</b></p> <p>Variable/intermittent attention, reasonably conscientious, some imperfections, unremarkable.</p>	<p align="center"><b>(5-6 marks)</b></p> <p><b>Alert, focussed on task. Attentive and persistently pursuing excellence. Using feedback to identify problems for correction.</b></p> <p>Noticing, checking, persistent, perfecting, refining, accurate, focus on quality, precision, refinement, faultless, meticulous.</p>
		<p><b>Examples of attending to detail:</b> Meeting specific requirements of the task, attention to detail when completing drawings and modelling (accuracy, neatness, annotation, orientation of components, quality of joints, removal of residue, finishing).</p>		
		Candidate showed limited attention to detail. Evidence provided showed inaccuracies or gaps in assessment tasks.	Candidate showed consistent attention to detail. Evidence provided was generally accurate and related to specific tasks.	Candidate was highly focused on the task showing care and attention to detail. Minimal errors were evident.

# Declaration of Authenticity

Candidate name

Candidate number

Centre name

Centre number

## Candidate:

**I confirm that all work submitted for this synoptic assignment is my own, and that I have acknowledged all sources I have used.**

Candidate signature

Date

## Tutor:

**I confirm that all work was conducted under conditions designed to assure the authenticity of the candidate's work, and am satisfied that, to the best of my knowledge, the work produced is solely that of the candidate.**

Tutor signature

Date

## Assessment feedback form

Candidate name

Candidate number

Tutor name

Date of assessment

Task / AO	Feedback

Tutor signature and date: