Non-Exam Assessment: Internal Synoptic Project

NCFE Level 1/2 Technical Award in Engineering (603/7006/3)

Centre copy

SAMPLE

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Contents

Introduction

The internal, non-exam assessment (NEA) takes the form of an internal synoptic project. It is a formal assessment that requires the learner to independently apply an appropriate selection of knowledge, understanding, skills and techniques, developed through the full course of study, in response to a real-world situation, to enable them to demonstrate an integrated connection and coherence between the different elements of the qualification.

The NEA will contribute 60% towards the overall qualification grade and therefore it is important that the learner produces work to the highest standard that they can. The learner, therefore, should not be entered for the internal synoptic project until they have been taught the full course of study, to ensure that they are in the best position to complete the internal synoptic project successfully.

What is synoptic assessment?

Synoptic assessment is an important part of a high-quality vocational qualification because it shows that learners have achieved a holistic understanding of the sector and that they can make effective connections between different aspects of the subject content and across the breadth of the assessment objectives in an integrated way. The Department for Education (DfE) has consulted with Awarding Organisations and agreed the following definition for synoptic assessment:

"**A form of assessment which requires a candidate to demonstrate that s/he can identify and use effectively in an integrated way an appropriate selection of skills, techniques, concepts, theories, and knowledge from across the whole vocational area, which are relevant to a key task.**"

Synoptic assessment enables learners to show that they can transfer knowledge and skills learnt in one context to resolve problems raised in another. To support the development of a synoptic approach, the qualification encourages learners to make links between elements of the course and to demonstrate how they have integrated and applied their increasing knowledge and skills.

As learners progress through the course, they will use and build upon knowledge and skills learnt across units. The internal synoptic project will test the learners' ability to respond to a real-world situation.

Information for learners

Introduction

The internal, non-exam assessment is a formal assessment that will contribute 60% towards your overall qualification grade. It takes the form of a synoptic project that will require you to draw on your knowledge and understanding of the entire qualification, it is therefore important that you produce work to the highest standard that you can.

You will be assessed on your ability to independently select, apply and bring together the appropriate knowledge, understanding, skills and techniques you have learnt throughout your course of study, in response to a brief, set in a real-world-situation.

The non-exam assessment will be assessed holistically using a levels of response mark grid and against five integrated assessment objectives. These assessment objectives and their weightings are shown below.

Assessment objective (AO)
AO1 – Recall knowledge and show understanding The emphasis here is for learners to recall and communicate the fundamental elements of knowledge and understanding. **20 marks (16.7%)**
AO2 – Apply knowledge and understanding The emphasis here is for learners to apply their knowledge and understanding to real-world contexts and novel situations, including finding creative solutions. **16 marks (13.33%)**
AO3 – Analyse and evaluate knowledge and understanding The emphasis here is for learners to develop analytical thinking skills to make reasoned judgements and reach conclusions. **16 marks (13.33%)**
AO4 – Demonstrate and apply relevant technical skills, techniques, and processes The emphasis here is for learners to demonstrate the essential technical skills relevant to the vocational sector, by applying the appropriate processes, tools, and techniques. **60 marks (50%)**
AO5 – Analyse and evaluate the demonstration of relevant skills and techniques. The emphasis here is for learners to analyse and evaluate the essential technical skills, processes, tools and techniques relevant to the vocational sector. **8 marks (6.7%)**

Suggested completion time

You have been provided with a total of **18** hours to complete this non-examined assessment.

You may use some or all of the time provided for each task.

You are allowed to use time given to one task on another task where required.

You are not allowed to exceed the total number of hours.

You should not start your internal synoptic project until you have been taught the full course of study. This will ensure that you are in the best position to complete the internal synoptic project successfully.

NCFE Level 1/2 Technical Award in Engineering (603/7006/3)

Internal Synoptic Project

Sample

To be given to learners on or after XX XXXXXXXX XXXX.

Learner instructions

- Read the project brief carefully before you start the work.
- You **must** clearly identify and label all of the work you produce during the supervised time.
- You **must** hand in all of your work to the supervisor at the end of each timed session.

Learner information

- This non-exam assessment (NEA) assessment will assess your knowledge and understanding from across the qualification.
- Total marks **120.**
- The suggested completion time for this internal synoptic project is 18 hours.
- All of the work you submit **must** be your own.

Please complete the details below clearly and in BLOCK CAPITALS.

Learner name _____

Centre name _____

Centre number | | | | | | Learner number | | | | | |

Learner signature _____

Project brief

You work for a mechanical engineering company who manufacture light fittings for household and office furnishing companies.

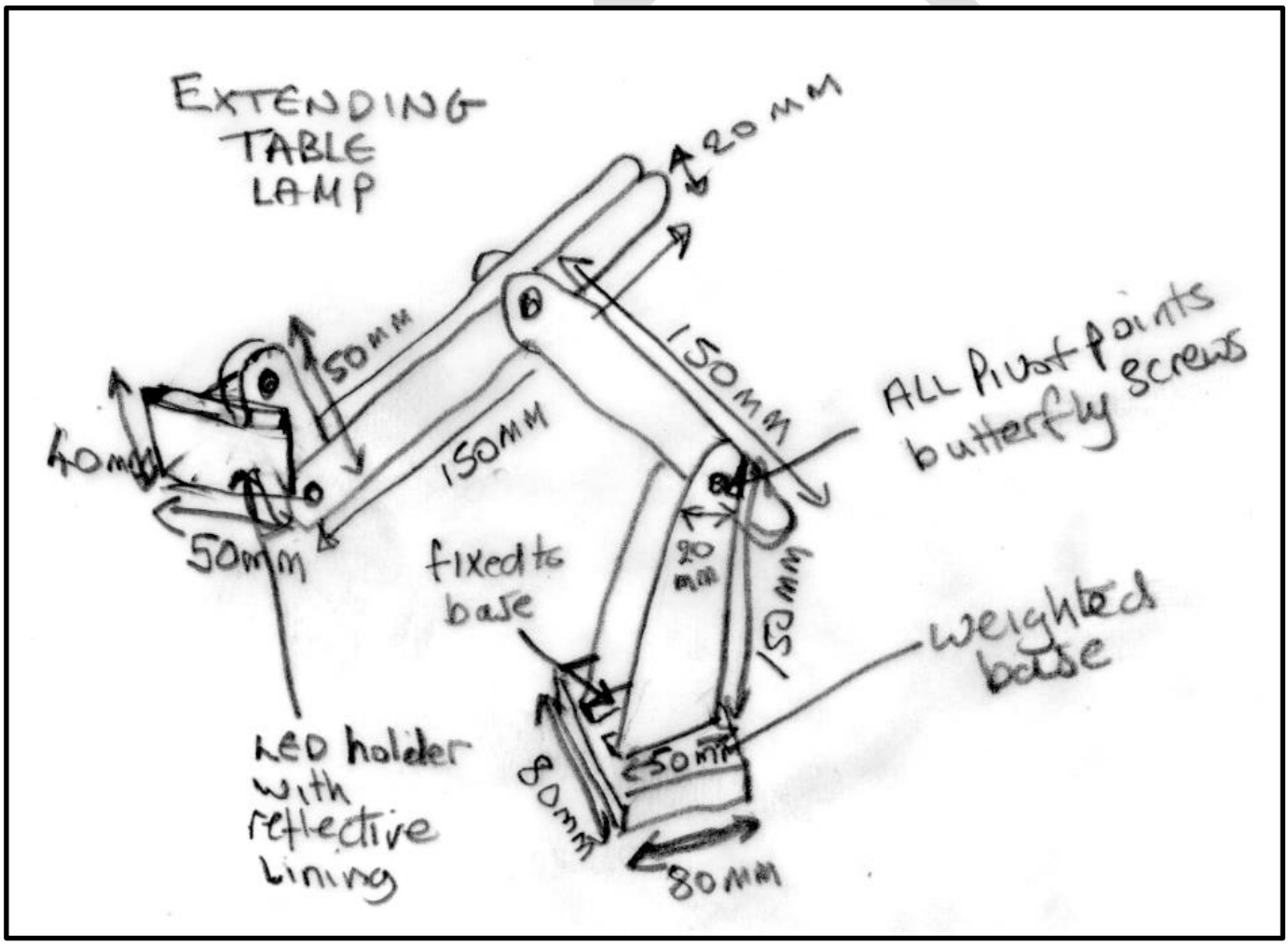
You have been asked to work on a new model of an LED table lamp and are required to produce a working, scaled model of the object to present to the board of directors.

You are required to produce a portfolio to accompany the model.

The portfolio should include isometric engineering drawings of the LED table lamp, a plan of production, evidence of testing and an evaluation.

You have been provided the free-hand sketch of the new LED table lamp.

Use this sketch throughout the project, as required.



Project instructions:

The mechanical engineering company have asked you to present a full portfolio which is to include:

1. Materials research and materials selection (1 hour 30 minutes)
2. Hand-drafted engineering drawings (2 hours 30 minutes)
3. Engineering drawings using CAD software (2 hours 30 minutes)
4. Production plan (4 hours)
5. Functioning prototype manufacture (6 hours)
6. Evaluation of your final product (1 hour 30 minutes)

Assessment tasks and mark scheme

<table>
<tr><td colspan="3">Task 1 – Materials research and materials selection</td></tr>
<tr><td colspan="2">Recommended time:</td><td>1 hour 30 minutes</td></tr>
<tr><td colspan="2">Content areas assessed:</td><td>1. Engineering disciplines
4. Properties, characteristics and selection of engineering materials.</td></tr>
<tr><td colspan="2">Assessment objectives:</td><td>AO1 – 4 marks
AO2 – 4 marks
AO3 – 4 marks</td></tr>
<tr><td colspan="3">You are required to:

Select the materials, tools and/or machinery that you will use to manufacture your LED table lamp.

You must also provide evidence to support and justify your selections.
[12 marks]</td></tr>
<tr><td>Evidence</td><td colspan="2">Information on materials, tools and/or machinery.

You need to show that you have researched and selected:

• material required to manufacture
• tools and/or machinery required to manufacture.

You need to show:

• supporting information to justify the selection of materials, tools and/or machinery.

You must include your internet browsing history used for research and planning purposes.

You could use the following formats to provide evidence for your research:

• written report
• annotated diagrams
• digital presentation.</td></tr>
</table>

Task 1 – Materials selection	
Marks	**Descriptors**
10–12	**AO1 – excellent** ability to research, reflecting a wide range of research sources in relation to the brief. All elements will be researched in a **detailed** and **effective** way. **AO2 – excellent** ability to apply knowledge and understanding to the scenario within the brief. **Highly suitable** creative selections, **very relevant** to the engineering piece. **AO3 – excellent** analysis of the brief, showing analytical thinking skills, with **highly reasoned** justifications and decisions in the choice of materials and tools/machinery. Learner has offered well considered approaches in order to meet the brief.
7–9	**AO1 – good** ability to research, reflecting a wide range of research sources in relation to the brief. Most elements of the brief will be researched in a **detailed** way. **AO2 – good** ability to apply knowledge and understanding to the scenario within the brief. **Suitable** creative selections, relevant to the engineering piece. **AO3 – good** analysis of the brief, showing some analytical thinking skills, with **reasoned** justifications and decisions in the choice of materials and tools/machinery. Learner has offered considered approaches in order to meet the brief.
4–6	**AO1 – reasonable** ability to research, reflecting a range of research sources in relation to the brief. **Some** elements will be researched in a reasonably detailed way. **AO2 – reasonable** ability to apply knowledge and understanding to the scenario within the brief. **Some** suitable creative selections, relevant to the engineering piece. **AO3 – limited** analysis of the brief, showing a limited level of analytical thinking, with **poorly** reasoned justifications and decisions in the choice of materials and tools/machinery. Learner has shown **limited** consideration of approaches to meet the brief.
1–3	**AO1 – limited** ability to research, reflecting limited use of research sources in relation to the brief. **Some** elements may be researched in a limited way. **AO2 – limited** ability to apply knowledge and understanding to the scenario within the brief. **Limited** suitable creative selections, relevant to the engineering piece. **AO3 – limited** analysis of the brief, showing limited analytical thinking, justification and decisions in the choice of materials and tools/machinery. Learner has shown **very limited** consideration of approaches to meet the brief.
0	No rewardable material

It is not a requirement that the learner formulates a response in their portfolio specifically against each assessment objective (AO) as laid out in the indicative content (IC). The evidence provided by the learner for each AO may be embedded throughout the evidence submitted for the task. Whilst it is likely that the responses will be illustrated by the IC points below, credit should be given for different approaches, providing they meet the key requirements of the task and mark scheme.

Indicative content:

AO1 – Learners will recall knowledge and show understanding of the following:

Materials required:

- characteristics and properties of ferrous alloys
- characteristics and properties of non-ferrous alloys
- characteristics and properties of polymers
- characteristics and properties of composites
- characteristics and properties of woods
- characteristics and properties of ceramics.

Tools/machinery:

- correct use of marking-out tools
- correct methods of modifying materials
- correct methods of joining materials
- correct methods of finishing materials.

AO2 – Learners will apply knowledge and understanding of the following:

- the LED table lamp will need to be functional in a home and office environment
- in order to successfully develop a working LED table lamp prototype, the appropriate materials would need to be selected
- when developing the LED table lamp prototype, the correct equipment will be needed to ensure the effective development. This would require accurate marking out of components, modifying the components to comply with drawing dimensions, joining the components correctly and finishing the prototype to ensure effective operation.

AO3 – Analyse and evaluate knowledge and understanding of the following:

- justifications on the choices made when deciding upon the material selected for the development of the LED table lamp prototype (for example, if coloured plastic selected this would be aesthetically pleasing to be used in the home)
- justifications on the choices made when deciding upon the tools and/or machinery selected for the development of the LED table lamp prototype (for example, a drill could be used to create the holes used at the pivot points).

Task 2 – Hand-drafted engineering drawings	
Recommended time:	**2 hours 30 minutes**
Content areas assessed:	2. Applied science and mathematics in engineering 3. Reading engineering drawings 6. Hand-drawn engineering drawings
Assessment objectives:	AO1 – 8 marks AO4 – 12 marks

You are required to:

Provide a brief description on the requirements of British standard 8888 which you can refer to throughout this project.

Create hand-drawn engineering drawing(s) of the free-hand sketch of the new LED table lamp provided in the brief.

[20 marks]

Evidence	Your evidence **must** include: • your description of BS 8888 • hand-drawn engineering drawing(s) of the LED table lamp.

Task 2 – Hand-drafted engineering drawing	
Marks	**Descriptors**
10–12	**AO4 – Meeting the needs of the brief: Excellent** consideration of all aspects of the brief. The needs of the engineering company are fully met in a **sophisticated** and **effective** manner through the creation of appropriate drawing(s). **AO4 – Technical skills: Excellent** ability to construct drawing(s). **Sophisticated** and **effective** technical skills are demonstrated along with the provision of **clear** and **detailed** drawing(s). **AO4 – Technical skills: Excellent** demonstration of drawing skills using a highly appropriate structure. Technical terms and layout are used **correctly** and **effectively** throughout. The drawing(s) is **accurate**, **sophisticated** and conform to all relevant standards.
7–9	**AO4 – Meeting the needs of the brief: Good** consideration of all aspects of the brief. The needs of the engineering company are **fully** met in an effective manner through the creation of **appropriate** drawing(s). **AO4 – Technical skills: Good** ability to construct drawing(s). **Effective** technical skills are demonstrated along with the provision of clear drawing(s). **AO4 – Technical skills: Good** demonstration of drawing skills using an appropriate structure. Technical terms and layout are used **correctly** and **effectively** throughout. The drawing(s) is **accurate** and conform to relevant standards.
5–6	**AO4 – Meeting the needs of the brief: Satisfactory** consideration of all aspects of the brief. The needs of the engineering company are met in a **mostly** appropriate manner through the creation of **mostly** appropriate drawing(s). **AO4 – Technical skills: Satisfactory** ability to construct drawing(s). **Satisfactory** technical skills are demonstrated along with the provision of **some** evidence of clear drawing(s). **AO4 – Technical skills: Satisfactory** demonstration of drawing skills using a **mostly appropriate** structure. Technical terms and layout are **satisfactorily** used. The drawing(s) is **moderately appropriate** with appreciation to relevant standards.
1–3	**AO4 – Meeting the needs of the brief: Limited** consideration of all aspects of the brief. The needs of the engineering company may **not** be fully met through the creation of drawing(s). **AO4 – Technical skills: Limited** ability to construct drawing(s). **Limited** technical skills are demonstrated along with the provision of **limited** evidence of clear drawing(s). **AO4 – Technical skills: AO4 – Limited** demonstration of drawing skills using a **somewhat** appropriate structure. Technical terms and layout are used in a **limited** way. The drawing(s) is **limited** with **some** appreciation of relevant standards.
0	No rewardable material.

Task 2 – Hand-drafted engineering drawing	
Marks	**Descriptors**
7–8	**AO1 – Excellent** recall of knowledge and understanding of relevant British standards that is **comprehensive**. **AO1 – Excellent** recall of knowledge and understanding of how to construct hand drawn engineering drawings that is **comprehensive**.
5–6	**AO1 – Good** recall of knowledge and understanding of relevant British standards that is **detailed**. **AO1 – Good** recall of knowledge and understanding of how to construct hand drawn engineering drawings that is **mostly detailed.**
3–4	**AO1 – Reasonable** recall of knowledge and understanding of relevant British standards that has **some detail**. **AO1 – Reasonable** recall of knowledge and understanding of how to construct hand drawn engineering drawings that has **some detail.**
1–2	**AO1 – Limited** recall of knowledge and understanding of relevant British standards that has **minimal detail.** **AO1 – Limited** recall of knowledge and understanding of how to construct hand drawn engineering drawings that has **minimal detail.**
0	No rewardable material.

It is not a requirement that the learner formulates a response in their portfolio specifically against each assessment objective (AO) as laid out in the indicative content (IC). The evidence provided by the learner for each AO may be embedded throughout the evidence submitted for the task. Whilst it is likely that the responses will be illustrated by the IC points below, credit should be given for different approaches, providing they meet the key requirements of the task and mark scheme.

Indicative content

AO1 – AO1 – Learners will recall knowledge and show understanding of the requirements of BS 8888:

- everything in the same language when graphically representing items
- ensures that all relevant information is included
- ensures that particular standards are met.

AO4 – Learners will demonstrate the application of vocational skills with the creation and completion of hand-drawn engineering drawings. The drawings will include the following:

- a consideration of the needs of the engineering company and its needs/requirements
- hand-drawn drawing or drawings that include the following:
  - 3-dimensional
  - scale
  - dimension:
    - angles
    - lengths
    - diameters
  - unit of measurement
    - metric
  - lines:
    - visible
    - hidden
    - centre
    - construction
  - tolerance (+ or -)
  - title block.

Task 3 – CAD produced engineering drawings	
Recommended time:	**2 hours 30 minutes**
Content areas assessed:	2. Applied science and mathematics in engineering 3. Reading engineering drawings 7. Computer-aided design (CAD) engineering drawings
Assessment objectives:	AO1 – 8 marks AO4 – 12 marks
You are required to: Use CAD software to create engineering drawing(s) of the free-hand sketch of the new LED table lamp included in the brief. Your drawing(s) must apply a layout recognised within the engineering industry following British Standards. **[20 marks]**	
Evidence	Your evidence **must** include: • CAD software engineering drawing(s) of the LED table lamp.

Task 3 - CAD produced engineering drawing	
Marks	**Descriptors**
10–12	**AO4 – Meeting the needs of the brief: Excellent** consideration of all aspects of the brief. The needs of the engineering company are fully met in a **sophisticated** and **effective** manner through the creation of appropriate drawing(s). **AO4 – Technical skills: Excellent** ability to construct drawing(s). **Sophisticated** and **effective** technical skills are demonstrated along with the provision of clear and detailed drawing(s). **Excellent** demonstration of drawing skills using a **highly** appropriate structure. Technical terms and layout are used correctly and **effectively** throughout. **AO4 –** The drawing(s) is **accurate** and conform to all relevant standards.
7–9	**AO4 – Meeting the needs of the brief: Good** consideration of all aspects of the brief. The needs of the engineering company are fully met in an **effective** manner through the creation of appropriate drawing(s). **AO4 –Technical skills: Good** ability to construct drawing(s). **Effective** technical skills are demonstrated along with the provision of clear drawing(s). **Good** demonstration of drawing skills using an appropriate structure. Technical terms and layout are used correctly and throughout. **AO4 –** The drawing(s) is **accurate** and conform to relevant standards.
4–6	**AO4 – Meeting the needs of the brief: Satisfactory** consideration of all aspects of the brief. The needs of the engineering company are met in a **mostly** appropriate manner through the creation of **mostly** appropriate drawing(s). **AO4 – Technical skills: Satisfactory** ability to construct drawing(s). **Satisfactory** technical skills are demonstrated along with the provision of some evidence of clear drawing(s). **Satisfactory** demonstration of drawing skills using a mostly appropriate structure. Technical terms and layout are **satisfactorily** used. **AO4 –**The drawing(s) is **moderately** appropriate with appreciation to relevant standards.
1–3	**AO4 – Meeting the needs of the brief** **Limited** consideration of all aspects of the brief. The needs of the engineering company may not be fully met through the creation of drawing(s). **AO4 – Technical skills** **Limited** ability to construct drawing(s). **Limited** technical skills are demonstrated along with the provision of limited evidence of clear drawing(s). **Limited** demonstration of drawing skills using a somewhat appropriate structure. Technical terms and layout are used in a **limited** way. **AO4 –** The drawing(s) is **limited** with some appreciation of relevant standards.
0	No rewardable material

Task 3 - CAD produced engineering drawing	
Marks	**Descriptors**
7–8	**AO1 – Excellent** recall of knowledge and understanding of relevant British standards that is **comprehensive**. **AO1 – Excellent** recall of knowledge and understanding of how CAD drawn engineering drawings are constructed that is **comprehensive**.
5–6	**AO1 – Good** recall of knowledge and understanding of relevant British standards that is **detailed**. **AO1 – Good** recall of knowledge and understanding of how CAD drawn engineering drawings are constructed that is **mostly detailed.**
3–4	**AO1 – Reasonable** recall of knowledge and understanding of relevant British standards that has **some detail**. **AO1 – Reasonable** recall of knowledge and understanding of how CAD drawn engineering drawings are constructed that has **some detail.**
1–2	**AO1 – Limited** recall of knowledge and understanding of relevant British standards that has **minimal detail.** **AO1 – Limited** recall of knowledge and understanding of how CAD drawn engineering drawings are constructed that has **minimal detail.**
0	No rewardable material

It is not a requirement that the learner formulates a response in their portfolio specifically against each assessment objective (AO) as laid out in the indicative content (IC). The evidence provided by the learner for each AO may be embedded throughout the evidence submitted for the task. Whilst it is likely that the responses will be illustrated by the IC points below, credit should be given for different approaches, providing they meet the key requirements of the task and mark scheme.

Indicative content

AO1 – Learners will recall knowledge and understanding of relevant British standards and how CAD drawn engineering drawings are created that may include the following:

- CAD drawn drawing or drawings that include the following:
  - 3-dimensional
  - scale
  - dimension:
    - angles
    - lengths
    - diameters
  - unit of measurement:
    - metric
  - lines:
    - visible
    - hidden

        - centre
        - construction
    - tolerance (+ or -)
    - title block
- British Standard 8888

AO4 – Learners will demonstrate the application of vocational skills with the creation and completion of CAD drawn engineering drawings. The drawings will include the following:

- a consideration of the needs of the engineering company and its needs/requirements
- CAD drawn drawing or drawings that include the following:
    - 3-dimensional
    - angle applied to the sides
    - scale
    - dimension
    - unit of measurement
    - lines:
    - tolerance (+ or -)
    - title block
- clear understanding of relevant British Standard:
    - this should include an understanding of and compliance with:
        - how BS 8888 is applied to engineering drawings.

<table>
<tr><td colspan="3">Task 4 – Production plan</td></tr>
<tr><td colspan="2">Recommended time:</td><td>4 hours</td></tr>
<tr><td colspan="2">Content areas assessed:</td><td>5: Engineering tools, equipment, and machines
8: Production planning techniques</td></tr>
<tr><td colspan="2">Assessment objectives:</td><td>AO2 – 12 marks
AO3 – 12 marks</td></tr>
<tr><td colspan="3">You are required to:

• create a production plan for your engineering prototype, based on the drawings you developed in tasks 2 and 3.

[24 marks]</td></tr>
<tr><td>Evidence</td><td colspan="2">Your evidence must include:

• a plan of your engineering prototype

Your plan must evidence each of the following areas:

• tools and equipment requirements
• health and safety measures
• quality control measures
• production plan
• time plan (including timescales and deadlines for completion of tasks).

You should also justify each of the planning decisions made.

You must include your internet browsing history used for research and planning purposes.

You could use a range of the following to provide evidence for your plan:

• written report
• annotated diagrams
• digital presentation
• screen shots.</td></tr>
</table>

Task 4 – Production plan	
Marks	**Descriptors**
10–12	**AO2 – Excellent** application of knowledge and understanding of the planning process in a **highly appropriate** format. **AO2 – Highly appropriate** planning tools will be selected and used **effectively**. **AO2 –** Prototype manufacturing features are **highly relevant** and described with **strong detail**. Requirements, measures and techniques are described with **excellent detail** and understanding of their use within the production of the product.
7–9	**AO2 – Good** application of knowledge and understanding of the planning process in a **completely appropriate** format. **AO2 – Appropriate** planning tools will be selected and used **effectively.** **AO2 –** Prototype manufacturing features are **relevant** and described with detail. Requirements, measures and techniques are described with **good** detail and understanding of their use within the production of the product.
4–6	**AO2 – Limited** application of knowledge and understanding of the planning process in a **somewhat appropriate** format. **AO2 – Some** planning tools will be selected and used with **some** success. **AO2 –** Prototype manufacturing features may not be relevant or described with clear understanding. Requirements, measures, and techniques are described with detail and understanding of their use within the production of the product.
1–3	**AO2 – Very limited** application of knowledge and understanding of the planning and the format may not be appropriate. **AO2 –** Planning tools may be selected and used, but with **limited** success. **AO2 –** Prototype manufacturing features may not be relevant or described sufficiently and **lack clear understanding.** Requirements, measures, and techniques are described with **very limited** detail and understanding of their use within the production of the product.
0	No rewardable material.

Task 4 – Production plan	
Marks	**Descriptors**
10-12	**AO3 –** Planning will contain **excellent** justification of decisions made. Conclusions will be very clear and detailed with **excellent** reasoning. **AO3 –** Engineering features will also be very well justified and **relevant** to the brief, as well as in line with their own proposal. **AO3 –** The analysis of the requirements, measures and techniques that are to be used is of **excellent** detail, with **excellent** reasoning and judgement made.

Task 4 – Production plan	
Marks	**Descriptors**
7–9	**AO3 –** planning will contain **good** justification of decisions made. Conclusions will be clear and detailed with **good** reasoning. **AO3 –** Engineering features will also be justified and **relevant** to the brief, as well as in line with their own proposal. **AO3 –** The analysis of the requirements, measures and techniques that are to be used is of **good** detail, with **clear** reasoning and judgement made.
4–6	**AO3 –** Planning will contain **limited** justification of decisions made. Conclusions may not be clear and are **limited** in reasoning. **AO3 – Some** engineering features may not be justified or relevant to the brief. Planning may not be in line with their own proposal. **AO3 –** The analysis of the requirements, measures and techniques that are to be used is of **limited** detail, with **limited** reasoning and judgement made.
1–3	**AO3 –** Planning will contain **very limited** justification of decisions made. Conclusions are not be clear and are **limited** in reasoning. **AO3 – Very few** engineering features are justified or relevant to the brief. Planning may not be in line with their own proposal. **AO3 –** The analysis of the requirements, measures and techniques that are to be used is of **very limited** detail, with unclear reasoning and judgement made.
0	No rewardable material.

It is not a requirement that the learner formulates a response in their portfolio specifically against each assessment objective (AO) as laid out in the indicative content (IC). The evidence provided by the learner for each AO may be embedded throughout the evidence submitted for the task. Whilst it is likely that the responses will be illustrated by the IC points below, credit should be given for different approaches, providing they meet the key requirements of the task and mark scheme.

Indicative content

AO2 – Learners will apply knowledge and understanding of the following:

- consideration of health and safety measures that are required to complete the LED table lamp prototype safely. This could include the wearing of safety goggles and use of safety guard to protect from broken drill bits
- the production plan that focuses on the development of prototype could include these:
  - flow chart
  - Gantt chart
  - spreadsheet
- information on quality control measures that should be implemented during and after the production of the LED table lamp prototype to ensure that it is produced to the highest possible standard.

AO3 – Analyse and evaluate knowledge and understanding of the following:

- information on the tools and equipment required and justification as to why these are necessary
- information on quality control measures that should be implemented and justification on why these are important
- a time plan that shows how time will be allocated and a justification as to why this has been planned.

Task 5 – Functioning prototype manufacture	
Recommended time:	**6 hours**
Content areas assessed:	9: Applied Processing Skills and Techniques
Assessment objectives:	AO4 – 36 marks

Using the drawings **and** plan assets that you developed in tasks 2-4 **you are required to:**

- create a functioning prototype of the LED table lamp to an appropriate scale. **You must use suitable processing skills and techniques**
- test the functionality of the prototype.

Your prototype **must:**

- meet the needs of the brief
- follow your hand-drawn and CAD drawings
- be fully functional.

[36 marks]

Evidence	You **must** provide: • your functioning prototype • evidence of production processes, skills, and techniques • evidence of prototype testing. You **could** use a range of the following formats to provide evidence of your production process: • digital presentation • written report • annotated screenshots • annotated images.

Task 5 – Functioning prototype manufacture- Meeting the needs of the brief	
Marks	**Descriptors**
10–12	**AO4 – Meeting the needs of the brief: Excellent** consideration of all aspects of the brief. **AO4 –** The needs of the engineering company are **fully** met in a **sophisticated** and **effective** manner. **AO4 –**Production/manufacturing choices are **appropriate** and **effective.**
7–9	**AO4 – Meeting the needs of the brief: Good** consideration of all aspects of the brief. **AO4 –** The needs of the engineering company are **mostly** met in an **effective** manner. **AO4 –** Production/manufacturing choices are **appropriate.**
4–6	**AO4 – Meeting the needs of the brief: Reasonable** consideration of some aspects of the brief. **AO4 – Some** of the needs of the engineering company are met in a **sound** manner. **AO4 –** Production/manufacturing choices are **somewhat appropriate**.
1–3	**AO4 –Meeting the needs of the brief: Limited** consideration of some aspects of the brief. **AO4 – Limited** needs of the engineering company are met. **AO4 –** Production/manufacturing choices are of **limited** appropriateness.
0	No rewardable material.

Task 5 – Functioning prototype manufacture- Technical Skills	
Marks	**Descriptors**
10–12	**AO4 – Technical skills: Excellent** ability to construct a fully functioning prototype. **AO4 – Sophisticated** and **effective** technical skills are demonstrated along with the provision of **clear** and **detailed** evidence of processing skills and techniques. **AO4 – Excellent** translation of drawings to the prototype.
7–9	**AO4 – Technical skills: Good** ability to construct a fully functioning prototype. **AO4 – Effective** technical skills are demonstrated, along with the provision of **clear** evidence of processing skills and techniques. **AO4 – Good** translation of drawings to the prototype.
4–6	**AO4 – Technical skills: Reasonable** ability to construct a functioning prototype. **AO4 –** Technical skills are demonstrated along with the provision of **some** evidence of processing skills and techniques.

Task 5 – Functioning prototype manufacture- Technical Skills	
Marks	**Descriptors**
	AO4 – Reasonable translation of drawings to the prototype.
1–3	**AO4 – Technical skills: Limited** ability to construct a functioning prototype. **AO4 – Limited** technical skills are demonstrated along with the provision of **limited** evidence of processing skills and techniques. **AO4 – Limited** translation of drawings to the prototype.
0	No rewardable material.

Task 5 – Functioning prototype manufacture- Functionality of the product	
Marks	**Descriptors**
10–12	**AO4 – Functionality of the product: Fully** functioning prototype with **excellent** functionality. **AO4 –** The prototype will **fully** meet the requirements of such a machine. **AO4 –** Product testing is **appropriate**, **detailed** and **comprehensive**.
7–9	**AO4 – Functionality of the product: Fully** functioning prototype with **good** functionality. **AO4 –** The prototype will **mostly** meet the requirements of such a machine. **AO4 –** Product testing is **appropriate** and **detailed**.
4–6	**AO4 – Functionality of the product:** Functioning prototype with **reasonable** functionality. **AO4 –** The prototype will **somewhat** meet the requirements of such a machine. **AO4 –** Product testing is **appropriate and in some detailed.**
1–3	**AO4 – Functionality of the product:** Functioning prototype with **limited** functionality. **AO4 –** The prototype may be unfinished or missing elements. **AO4 –** Product testing is **limited**.
0	No rewardable material.

It is not a requirement that the learner formulates a response in their portfolio specifically against each assessment objective (AO) as laid out in the indicative content (IC). The evidence provided by the learner for each AO may be embedded throughout the evidence submitted for the task. Whilst it is likely that the responses will be illustrated by the IC points below, credit should be given for different approaches, providing they meet the key requirements of the task and mark scheme.

Indicative content

AO4 – Learners will demonstrate the application of vocational skills with the creation and completion of a functioning prototype of the LED table lamp.

- Prototype models may show evidence that learners have considered:
  - scale
  - dimension in accordance with drawings
  - materials used in accordance with production plan and/or drawings
  - tolerance (+ or -) within acceptable values
  - function of prototype conforming to requirements of the brief
  - Pivot points and rotational base according to requirements.

Task 6 – Summative evaluation	
Recommended time:	**1 hours 30 minutes**
Content areas assessed:	8: Production planning techniques
Assessment objectives:	AO5 – 8 marks

You are required to:

Evaluate your final product.

Your evaluation **must** include:

- how your prototype met the brief
- how you could improve your prototype, in relation to the brief.

As a minimum you **must** consider the following three areas within your response:

- functionality of the prototype
- how well it met the brief
- how suitable it is for the specified use (home and/or office).

[8 marks]

Evidence	You **must** provide: • your evaluation. You could use the following formats to provide evidence of your evaluation: • annotated screenshots • written report.

Summative evaluation of the product	
Marks	**Descriptors**
7–8	**AO5 – Excellent** analysis and evaluation of the success of the final prototype, it's functionality, how well it met the brief and suitability to the specified industry that is **comprehensive** and **highly detailed.** **AO5 –** Supported by **thoughtful** and **imaginative and highly relevant** examples of ways to improve the engineering prototype are provided.
5–6	**AO5 – Good** analysis and evaluation of the success of the final prototype, it's functionality, how well it met the brief and suitability to the specified industry that is **mostly detailed** and **considered** way. **AO5 –** Supported by **thoughtful, useful** and **mostly relevant** examples of ways to improve the engineering prototype are provided.
3–4	**AO5** – **Reasonable** analysis and evaluation of the success of the final prototype, it's functionality, how well it met the brief and suitability to the specified industry that is **some detail.** **AO5 –** Supported by at **least one** example of a way to improve the engineering prototype is provided that has **some relevance**.
1–2	**AO5** – **Limited** analysis and evaluation of the success of the final prototype, it's functionality, how well it met the brief and suitability to the specified industry that has **minimal detail.** **AO5 –** Supported by at **least one** example of a way to improve the engineering prototype is provided that has **minimal** or **no relevance**.
0	No rewardable material.

It is not a requirement that the learner formulates a response in their portfolio specifically against each assessment objective (AO) as laid out in the indicative content (IC). The evidence provided by the learner for each AO may be embedded throughout the evidence submitted for the task. Whilst it is likely that the responses will be illustrated by the IC points below, credit should be given for different approaches, providing they meet the key requirements of the task and mark scheme.

Indicative content

AO5 – A learner will analyse and evaluate the whole process of developing the LED table lamp prototype, including:

- evaluation of how well the drawings, planning and production of the prototype to include the following:
  - were the materials tools and/or machinery selected ultimately the correct ones
  - how effective were the hand-drawn engineering drawings, accurate and useful?
  - how effective were the CAD drawn engineering drawings, accurate and useful?
  - how useful and accurate was the production plan and how closely was this followed?

- was the production of the final prototype successful and did the functionality of the LED table lamp perform as desired?
- how suitable to the industry was the final product
- how could the process be improved?

This is the end of the non-exam assessment

Mark scheme

The purpose of this mark scheme is to give you:

- examples and criteria of the types of response expected from a learner
- information on how individual marks are to be awarded
- the allocated assessment objective(s) and total marks for each question.

Marking guidelines

General guidelines

You must apply the following marking guidelines to all marking undertaken. This is to ensure fairness to all learners, who must receive the same treatment. You must mark the first student in exactly the same way as you mark the last.

- The mark scheme must be referred to throughout the marking period and applied consistently, do not change your approach to marking once you have been standardised.
- Reward learners positively, giving credit for what they have shown, rather than what they might have omitted.
- Utilise the whole mark range and always award full marks when the response merits them.
- Be prepared to award zero marks if the learner's response has no creditworthy material.
- Do not credit irrelevant material that does not answer the question, no matter how impressive the response might be.
- If you are in any doubt about the application of the mark scheme, you must consult with your centres internal quality assurer.

Guidelines for using extended response marking grids

Extended response mark grids have been designed to assess learners' work holistically. They consist of levels-based descriptors and indicative content.

Levels-based descriptors.

Each level is made up of several descriptors for across the AO range – AO1 to AO5, which when combined provide the quality of response that a student needs to demonstrate. Each level-based descriptor is worth varying marks.

The grids are broken down into levels, with each level having an associated descriptor indicating the performance at that level. You should determine the level before determining the mark.

Indicative content reflects content-related points that a student may make but is not an exhaustive list, nor is it a model answer. Learners may make all, some or none of the points included in the indicative content, as its purpose is as a guide for the relevance and expectation of the responses. Learners must be credited for any other appropriate response.

Application of extended response marking grids

When determining a level, you should use a bottom-up approach. If the response meets all the descriptors in the lowest level, you should move to the next one, and so on, until the response matches the level descriptor. Remember to look at the overall quality of the response and reward learners positively, rather than focussing on small omissions. If the response covers aspects at different levels, you should use a best-fit approach at this stage and use the available marks within the level to credit the response appropriately.

When determining a mark, your decision should be based on the quality of the response in relation to the descriptors.