



NCFE Level 1/2 Technical Award in Engineering (603/2963/4)

Past Paper

March 2019

Unit 01 Understanding the engineering world

Mark Scheme

v1.2 Post Standardisation

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This mark scheme has been written by the Assessment Writer and refined, alongside the relevant questions, by a panel of subject experts through the external assessment writing process and at standardisation meetings.

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 mark for each question.

Marking guidelines

General guidelines

You must apply the following marking guidelines to all marking undertaken throughout the marking period. This is to ensure fairness to all learners, who must receive the same treatment. You must mark the first learner 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.
- The marks awarded for each response should be clearly and legibly recorded in the grid on the front of the question paper.
- If you are in any doubt about the application of the mark scheme, you must consult with your Team Leader or the Chief Examiner.

Guidelines for using extended response marking grids

Extended response marking grids have been designed to award a learner's response holistically and should follow a best-fit approach. 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.

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. You must also consider the relative weightings of the assessment objectives, so as not to over/under credit a response. Standardisation materials, marked by the Chief Examiner, will help you with determining a mark. You will be able to use exemplar learner responses to compare to live responses, to decide if it is the same, better or worse.

You are reminded that the indicative content provided under the marking grid is there as a guide, and therefore you must credit any other suitable responses a learner may produce. It is not a requirement either, that learners must cover all of the indicative content to be awarded full marks.

Assessment objectives

This unit requires learners to:

AO1	Recall knowledge and show understanding.
AO2	Apply knowledge and understanding.
AO3	Analyse and evaluate knowledge and understanding.

The weightings of each assessment objective can be found in the qualification specification.

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Qu	Mark scheme	Total marks
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Section A

Total for this section: 15 marks

1	<p>State the engineering discipline responsible for the modification to the rice.</p> <p>Award one mark for any one of the following:</p> <ul style="list-style-type: none"> • Chemical Engineering • Food Engineering • Food & Drink Engineering • Genetic Engineering • Bio Engineering <p>Examiner Guidance: Accept without “engineering”</p>	<p>1 AO1=1</p>
2	<p>In aeronautical engineering which would be the most suitable scale for producing drawings of a Boeing 747 aircraft in A3.</p> <p>Answer: D 1:200</p>	<p>1 AO1=1</p>
3	<p>Which one of the following is the required downward force of a two-wheel pulley system?</p> <p>Answer: B The downward force required would be half the weight of the load</p>	<p>1 AO1=1</p>
4	<p>Identify which of the following is not covered under COSHH.</p> <p>Answer: D Radioactive substances</p>	<p>1 AO1=1</p>

5	<p>State one form of PPE which should be worn and explain how this would protect the individual.</p> <p>Award one mark for stating one form of PPE appropriate for the task, learners should state the actual PPE, category titles i.e. clothing should not be accepted.</p> <ul style="list-style-type: none"> ● eye protection - to protect the eyes from dust and swarf. <ul style="list-style-type: none"> ○ goggles ○ faceshield ○ safety glasses ○ full face visor ○ protective glasses <p>Examiner Guidance: facemask accepted with explanation</p> <ul style="list-style-type: none"> ● clothing - to avoid entanglement of loose clothing, to keep clothing clean. <ul style="list-style-type: none"> ○ apron ○ overalls ○ lab coat ○ boiler suit. <p>Reward any other suitable responses if appropriately justified in the explanation.</p> <ul style="list-style-type: none"> ● ear protection <ul style="list-style-type: none"> ○ ear defenders ○ ear plugs. ● footwear <ul style="list-style-type: none"> ○ steel toe capped boots. <p>Do not accept any forms of the follow as these are no appropriate for the given task:</p> <ul style="list-style-type: none"> ● hand and arm protection ● respiratory. ● drill guard to pillar drill ● hair ties 	<p>2</p> <p>AO1=2</p>
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6	Explain how the invention of the washing machine has solved problems and the impact the washing machine has had on the modern world.	9 AO1=3 AO2=3 AO3=3
Level	Marks	Description
3	7–9	<p>A wide range of relevant knowledge and understanding is shown, which is accurate and detailed. Subject specific terminology is used consistently throughout.</p> <p>Application of knowledge and understanding is appropriate, with clear relevance to the context.</p> <p>Analysis and evaluation is present and very effective. The conclusions drawn are fully supported by judgements.</p>
2	4–6	<p>A range of relevant knowledge and understanding is shown, but may be lacking in sufficient detail, with a few errors. Subject specific terminology is used, but not always consistently.</p> <p>Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors.</p> <p>Analysis and evaluation is present and effective but may be lacking appropriate development. There are attempts to draw conclusions, which are supported by judgements, but it is likely that some will be irrelevant.</p>
1	1–3	<p>A limited range of relevant knowledge and understanding is shown, but is often fragmented. Subject specific terminology, if used, is often inappropriate and a lack of understanding is evident.</p> <p>Application of knowledge and understanding is inappropriate, with any attempt showing fundamental errors.</p> <p>Analysis and evaluation, if present, is of limited effectiveness. Attempts to draw conclusions are seldom successful and likely to be irrelevant.</p>
	0	No creditworthy material

	<p>Indicative content/Possible content could include:</p> <p>Stating a problem which has been solved, accept any of the following responses:</p> <ul style="list-style-type: none"> ● Less time consuming ● Less physical demand ● Cleaner clothes, cycles (programmes), hygiene ● Work done by a machine not a person, no human intervention (other than programming) ● faster spins speeds and drying <p>Credit other suitable responses.</p>	
<p>7</p>	<p>Which one of the following is the correct full title for 'RIDDOR'?</p> <p>Answer: C Reporting of Injuries, Diseases and Dangerous Occurrences Regulations</p>	<p>1 AO1=1</p>
<p>8</p>	<p>Which one of the following SI units would be used to measure an amount of substance?</p> <p>Answer: D Millimole</p>	<p>1 AO1=1</p>
<p>9</p>	<p>Which one of the following units of measurement is not an SI base unit?</p> <p>Answer: C Inch</p>	<p>1 AO1=1</p>

<p>10</p>	<p>State what the initials CFRP stand for and give one engineering application.</p> <p>Award 1 mark for identifying the material. Accept any of the following:</p> <ul style="list-style-type: none"> ● Carbon fibre reinforced polymer. ● Carbon fibre polymer. ● Carbon fibre plastic. ● Carbon fibre reinforced plastic. <p>Award 1 mark for explaining one engineering application.</p> <ul style="list-style-type: none"> ● Boeing 787 Dreamliner, other modern aerospace engineering uses. ● Sports equipment e.g. Tennis rackets, golf clubs, softball bats, hockey sticks, and archery arrows and bows. ● Bicycles. ● Wind turbine blades. ● F1 racing cars. ● Automotive parts. ● Boats. ● Bridge cables. ● Smart phone case <p>Credit other suitable responses.</p> <p>Examiner Guidance: Don't accept just two words carbon fibre</p>	<p>2</p> <p>AO1=1</p> <p>AO2=1</p>
<p>11</p>	<p>Using the equations provided on pages 2 and 3, calculate the current going through the kettle.</p> <p>Award 1 mark for each of the following:</p> <ul style="list-style-type: none"> ● Correct selection of equation from the given list. <ul style="list-style-type: none"> ○ $I = P \div V$ ● Correct application of equation using the figures given <ul style="list-style-type: none"> ○ Current = $1500 \div 240$ <p>Award 3 marks if correct answer given (6.25) with no equation or calculation provided.</p> <p>Examiner Guidance: If no equation stated but is implied as numbers (Power and voltage) are in the correct order then 2 marks can be awarded with no correct answer present.</p>	<p>3</p> <p>AO1=1</p> <p>AO2=2</p>

<p>12</p>	<p>Using the equations provided on pages 2 and 3, calculate the speed that the aircraft must be travelling at.</p> <p>Award 1 mark for each of the following:</p> <ul style="list-style-type: none"> ● Correct selection and rearrangement of equation from the given list. <ul style="list-style-type: none"> ○ $s = d \div t$ ● Correct application of equation using the figures given <ul style="list-style-type: none"> ○ Speed = $5540 \div 8$ <p>Award 3 marks if correct answer given (692.5 Km/h or 692.5) with no equation or calculation provided.</p> <p>Examiner Guidance: If no equation stated but is implied as numbers (Distance and time) are in the correct order then 2 marks can be awarded with no correct answer present.</p>	<p>3</p> <p>AO1=1</p> <p>AO2=2</p>
<p>13</p>	<p>Explain what impact the use of an incorrect scale can have on the manufacturing process and final outcome.</p> <p>Award 1 mark for a basic description of impact, with little emphasis of the importance of this.</p> <p>Award 2 marks to be given for a description of the importance of impact, but with no reference to the manufacturing process.</p> <p>Award 3 marks to be given for an explanation of the impact this could have on manufacture, which may be superficial or lack a clear depth of understanding.</p> <p>Award 4 marks to be given for detailed explanation of the impact this would have on the manufacture process, which demonstrates a range of critical judgement and a clear depth of understanding</p> <p>Credit other suitable response. Credit use of examples.</p>	<p>4</p> <p>AO1=2</p> <p>AO3=2</p>
<p>14</p>	<p>What is the name of this type of line?</p> <p>Award 1 mark for centre line.</p> <p>Examiner Guidance: Accept “centre”</p>	<p>1</p> <p>AO1=1</p>

15	<p>Which system of measurement is a yard associated with?</p> <p>Award 1 mark for imperial.</p>	<p>1</p> <p>AO1=1</p>
16	<p>What does the symbol represent?</p> <p>Award 1 mark for third angle projection.</p> <p>Award 1 mark for first angle projection</p> <p>Award 1 mark for angle projection</p> <p>Award 1 mark for orthographic projection</p>	<p>1</p> <p>AO1=1</p>
17	<p>Read the drawing and state in millimetres (mm), the full height, width and depth of the bracket.</p> <p>Award:</p> <p>1 mark for height 170mm</p> <p>1 mark for width 70mm</p> <p>1 mark for depth 60mm</p> <p>Or</p> <p>1 mark for height 170mm</p> <p>1 mark for width 60mm</p> <p>1 mark for depth 70mm</p>	<p>3</p> <p>AO2=3</p>

18	Analyse the benefits this has on the manufacturing process of a product.			9 AO1=3 AO2=3 AO3=3
	Level	Marks	Description	
	3	7 – 9	<p>A coherent explanation with reference the impact in a drawing and possibly subsequent manufacturing</p> <p>A wide range of relevant knowledge and understanding is shown, which is accurate and detailed. Subject specific terminology is used consistently throughout.</p> <p>Application of knowledge and understanding is appropriate, with clear relevance to the context.</p> <p>Analysis and evaluation is present and very effective. The conclusions drawn are fully supported by judgements.</p>	
	2	4 – 6	<p>A coherent explanation of what tolerance is but without reference to the use in engineering drawings.</p> <p>A range of relevant knowledge and understanding is shown, but may be lacking in sufficient detail, with a few errors. Subject specific terminology is used, but not always consistently.</p> <p>Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors.</p> <p>Analysis and evaluation is present and effective but may be lacking appropriate development. There are attempts to draw conclusions, which are supported by judgements, but it is likely that some will be irrelevant.</p>	
	1	1 – 3	<p>A basic explanation of tolerance, which may not be fully accurate or include reference to the plus-minus symbol.</p> <p>A limited range of relevant knowledge and understanding is shown, but is often fragmented. Subject specific terminology, if used, is often inappropriate and a lack of understanding is evident.</p>	

			<p>Application of knowledge and understanding is inappropriate, with any attempt showing fundamental errors. Analysis and evaluation, if present, is of limited effectiveness. Attempts to draw conclusions are seldom successful and likely to be irrelevant.</p> <p>Examiner Guidance: Reference to an engineering drawing does not have to be specifically implied</p>	
	0		No creditworthy material	

Indicative content/Possible content could include:

- Tolerance is the variation allowed on any stated dimension in order for the product being manufactured to still achieve its desired function.
- Tolerance is usually indicated in an engineering drawing with the plus-minus symbol (\pm), a mathematical sign used in engineering to demonstrate the variation allowed over + and under - the stated dimension.

Credit any other suitable response.

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19	<p>What is the purpose of BS 8888 in engineering drawings?</p> <p>Award 1 mark for explaining the purpose of BS 8888, which is a (National framework) standard for engineering drawings.</p> <p>Or</p> <p>Award 1 mark for explaining that it is a technical language outlining the information that engineers need to include in their drawings.</p> <p>Award any other suitable response.</p> <p>1 mark for a basic evaluation of the impact of BS 8888.</p> <p>Or</p> <p>2 marks for a coherent evaluation of the impact of BS 8888.</p> <p>Impacts include:</p> <ul style="list-style-type: none"> • easier to find key information • users have access to one reference source with all the relevant information • enables users to speak/read the same language (guidelines) when specifying and graphically representing products • provides precision and accuracy, leaving no room for misinterpretation • helps the smooth transfer of the design concept to the manufacturing process • shortens the product development time • increases speed to market. <p>Credit other suitable responses.</p>	<p>3</p> <p>AO1=1</p> <p>AO3=2</p>
20	<p>Which one of the following is not a chemical property?</p> <p>Answer: C Photosensitivity</p>	<p>1</p> <p>AO1=1</p>

<p>21</p>	<p>State one mechanical property of a car tyre and explain why this is important to its function.</p> <p>Award 1 mark for the property:</p> <ul style="list-style-type: none"> • strength • hardness • toughness • elasticity • plasticity (in manufacture only) • durability. <p>Award 1 mark for a basic explanation why this is important to the function of the car tyre.</p> <p>Or</p> <p>Award 2 marks for a coherent explanation why this is important to the function of the car tyre.</p> <p>Impacts include:</p> <ul style="list-style-type: none"> • Strength and durability to withstand wear and tear of regular driving and driving at high speeds. • Hardness avoids punctures. • Elasticity provide shock absorbency, providing a smoother ride. • Toughness protects the steel wheels from the road. • Toughness protects the road from the steel wheels. • Elasticity allows for slip, which benefits traction (grip), braking and cornering. • Plasticity in manufacture allows the tyres to be shaped and tread markings easily created. <p>Credit other suitable responses.</p>	<p>3</p> <p>AO1=1</p> <p>AO2=2</p>
<p>22</p>	<p>Name one type of aesthetic characteristic.</p> <p>1 mark to be given for any of the following answers:</p> <ul style="list-style-type: none"> • Colour • Surface finish (shiny) • Finish effect accept texture 	<p>1</p> <p>AO1=1</p>

<p>23</p>	<p>Which discipline of engineering would a smartphone be associated with?</p> <p>Award 1 mark to be given for any of the following answers:</p> <ul style="list-style-type: none"> • Electrical and electronic. • Communications/tele communications • Software. 	<p>1</p> <p>AO1=1</p>
<p>24</p>	<p>Explain what a fossil fuel is and the impact manufacturing acrylic is having on the environment.</p> <p>Award 1 mark for the explanation of what a fossil fuel is.</p> <p>A non-renewable energy source formed over millions of years from the remains of dead animals and plants buried underground. Heat from inside the earth and pressure from dirt and rock changes these fossils into oil, natural gas and coal.</p> <p>Award 1 mark for a basic evaluation of the impact. Or Award 2 marks for a coherent evaluation of the impact of using acrylic.</p>	<p>3</p> <p>AO1=1</p> <p>AO3=2</p>

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25	<p>Discuss the similarities and differences between thermoset polymers and thermoplastic polymers and why they might be selected to perform different engineering functions.</p> <table border="1"> <thead> <tr> <th data-bbox="280 338 392 376">Level</th> <th data-bbox="392 338 528 376">Marks</th> <th data-bbox="528 338 1230 376">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="280 376 392 1077">3</td> <td data-bbox="392 376 528 1077">7 – 9</td> <td data-bbox="528 376 1230 1077"> <p>A description containing similarities of the two plastics.</p> <p>A coherent explanation with reference to selection of the two types of polymers for specific functions.</p> <p>A wide range of relevant knowledge and understanding is shown, which is accurate and detailed. Subject specific terminology is used consistently throughout.</p> <p>Application of knowledge and understanding is appropriate, with clear relevance to the context.</p> <p>Analysis and evaluation is present and very effective. The conclusions drawn are fully supported by judgements.</p> </td> </tr> <tr> <td data-bbox="280 1077 392 1850">2</td> <td data-bbox="392 1077 528 1850">4 – 6</td> <td data-bbox="528 1077 1230 1850"> <p>A coherent explanation of what the two type of polymer are but without reference to selection of the two types of polymers for specific functions.</p> <p>A range of relevant knowledge and understanding is shown, but may be lacking in sufficient detail, with a few errors. Subject specific terminology is used, but not always consistently.</p> <p>Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors.</p> <p>Analysis and evaluation is present and effective but may be lacking appropriate development. There are attempts to draw conclusions, which are supported by judgements, but it is likely that some will be irrelevant.</p> </td> </tr> <tr> <td data-bbox="280 1850 392 2065">1</td> <td data-bbox="392 1850 528 2065">1 – 3</td> <td data-bbox="528 1850 1230 2065"> <p>A basic explanation of the two polymers which lacks any reference to their selection for specific functions</p> <p>A limited range of relevant knowledge and understanding is shown, but is often</p> </td> </tr> </tbody> </table>	Level	Marks	Description	3	7 – 9	<p>A description containing similarities of the two plastics.</p> <p>A coherent explanation with reference to selection of the two types of polymers for specific functions.</p> <p>A wide range of relevant knowledge and understanding is shown, which is accurate and detailed. Subject specific terminology is used consistently throughout.</p> <p>Application of knowledge and understanding is appropriate, with clear relevance to the context.</p> <p>Analysis and evaluation is present and very effective. The conclusions drawn are fully supported by judgements.</p>	2	4 – 6	<p>A coherent explanation of what the two type of polymer are but without reference to selection of the two types of polymers for specific functions.</p> <p>A range of relevant knowledge and understanding is shown, but may be lacking in sufficient detail, with a few errors. Subject specific terminology is used, but not always consistently.</p> <p>Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors.</p> <p>Analysis and evaluation is present and effective but may be lacking appropriate development. There are attempts to draw conclusions, which are supported by judgements, but it is likely that some will be irrelevant.</p>	1	1 – 3	<p>A basic explanation of the two polymers which lacks any reference to their selection for specific functions</p> <p>A limited range of relevant knowledge and understanding is shown, but is often</p>	<p>9</p> <p>AO1=3</p> <p>AO2=3</p> <p>AO3=3</p>
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26	<p>Name the tool in Image 3 and explain how it would be used in a practical application.</p> <p>Award 1 mark to be given for identifying the tool:</p> <ul style="list-style-type: none"> • centre punch • dot punch. <p>Award 1 mark to be given for explaining is it used with a hammer to mark an indentation.</p> <p>Award 2 marks to be given for explaining it is used to mark the centre of a hole in preparation for drilling holes, as a drill bit can skate around a workpiece if it does not start in a recess. A centre punch forms a large enough dimple (indent) to guide the tip of the drill.</p>	<p>3</p> <p>AO1=1</p> <p>AO3=2</p>
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<p>27</p>	<p>List two tools that could be used to mark out cutting lines on a piece of flat bar steel.</p> <p>1 marks for each correct answer:</p> <ul style="list-style-type: none"> • Scriber • Engineers scribe • Scribe • Steel rule (metal) • Steel ruler (metal) • Engineers Square • Engineers tri-square • Black marker (pen) • Pencil • Odd leg (callipers) (must contain oddleg) • dividers <p>Credit other suitable response.</p>	<p>2</p> <p>AO1=2</p>
<p>28</p>	<p>State the two methods of filing in Image 4.</p> <p>Award 1 mark for cross filing.</p> <p>Award 1 mark for draw filing.</p>	<p>2</p> <p>AO1=2</p>
<p>29</p>	<p>Which one of the following would be the most suitable saw to cut intricate external shapes and interior cut-outs?</p> <p>Answer: A Coping saw</p>	<p>1</p> <p>AO1=1</p>
<p>30</p>	<p>Which one of the following is not shown in Image 5?</p> <p>Answer: A Phillips</p>	<p>1</p> <p>AO1=1</p>

<p>31</p>	<p>List two mechanical fastenings used in the engineering industry to join together two pieces of aluminium.</p> <p>Award 1 mark for each of any of the following (up to a maximum of 2):</p> <ul style="list-style-type: none"> ● Riveting ● Nut and bolt ● Screw <p>Although not details in the specification, also accept any of the technically correct responses.</p> <ul style="list-style-type: none"> ● Any other valid mechanical fasteners 	<p>2</p> <p>AO1=2</p>
<p>32</p>	<p>List two control measures used in an engineering workshop.</p> <p>Award 1 mark for each of any of the following (up to a maximum of 2):</p> <ul style="list-style-type: none"> ● Training ● Risk assessment ● Guards ● Safety zones ● Power isolation ● Emergency power cut off ● Personal protective equipment (PPE) ● Extraction ● Ventilation ● Welding (screening) ● Lighting <p>Any other appropriate control measure</p>	<p>2</p> <p>AO1=2</p>
<p>33</p>	<p>Which one of the following is the best way to protect an employee working at a noisy machine?</p> <p>Answer: C Provide a pair of ear defenders</p>	<p>1</p> <p>AO1=1</p>