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

Past Paper

November 2019

Unit 01 Understanding the engineering world

Mark Scheme

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.

Qu	Mark scheme	Total marks
1	**Three of the following are found in the title box of an engineering drawing.** One **is** not **found in this box.** **Which one?** Answer: D Size of paper	1 **AO1=1**
2	**Which piece of Personal Protective Equipment (PPE) should a chemical engineer wear?** Answer: A Breathing mask	1 **AO1=1**
3a	**Give** two other **examples of employee responsibilities in the workplace.** Award one mark for any of the following (maximum of two marks): • take care of themselves • work safely at all times • to observe safety of others. Accept any other suitable response.	2 **AO1=2**
3b	**State** and **explain** one **piece of information you would expect to find on a risk assessment.** Award one mark for the piece of information (AO1) and a maximum of two marks for explaining this in the context of a risk assessment (AO2). Expect to see explanation of task to be performed, primary hazards, severity of hazards, score system, control measures to be used.	3 **AO1=1** **AO2=2**

3c	**Name** three **pieces of PPE that you must wear when you use an angle grinder.** Award one mark for each of the following (maximum of three marks): • safety goggles/face screen / visor • overalls / apron • ear defenders / ear plugs • safety boots / sturdy footwear • gloves • hard hat / cap • mask (dust) Accept any other suitable response.	**3** **AO1=3**

4a	**Which** one **of the following is classified as an engineering ceramic?** Answer: B Glass	**1** **AO1=1**

4bi	**Give** one **mechanical property and** one **aesthetic characteristic of stainless steel.** Award one mark for any of the following (mechanical): • ductile • strong • tough • durable / scratch resistant Accept any other suitable response. Award one mark for any of the following (aesthetic): • shiny / polished / reflective / smooth / mirrored • grained A maximum of one mark to be awarded for each element.	**2** **AO1=2**

4bii	**Give** two **examples of items which can be produced in engineering using stainless steel.** Award one mark for any of the following: • production of air conditioning • car exhausts • commercial kitchen equipment • hospital equipment • jewellery Accept any other suitable response.	**2** **AO1=2**

5	**Discuss the differences between ferrous and non-ferrous metals and explain why** each **may be chosen for production of an engineering product.**	**9** **AO1=3** **AO2=3** **AO3=3**

Level	Marks	Description
3	7–9	A wide range of relevant knowledge and understanding is shown, which is accurate and detailed. Subject specific terminology is used consistently throughout. Application of knowledge and understanding is appropriate, with clear relevance to the context. Analysis and evaluation are present and very effective. The conclusions drawn are fully supported by judgements.
2	4–6	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. Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors. Analysis and evaluation are 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.
1	1–3	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. 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.	
			0	No creditworthy material	

Indicative content:

- Ferrous metals mostly contain iron. They have small amounts of other metals or elements added, to give the required properties. Ferrous metals are magnetic and give little resistance to corrosion.
- Non-ferrous metals do not contain iron, are not magnetic and are usually more resistant to corrosion than ferrous metals.

Accept any other suitable response.

6	**Three of the following are properties of copper.** **Which** one **is** not**?** Answer: D Tensile resistant	**1** **AO1=1**

7	**Calculate the average speed of a car that travels 200 kilometres in 4 hours.** 200/4 (1) = 50kph (1) If learner just states 50kph with no working then award 2 marks.	**2** **AO2=2**

8	**Calculate the surface area of the component. Give your answer to** one **decimal place (1dp).** 3.142 (π) x 7^2 (1) = 153.9cm^2 (1) If learner just states 153.9 with no working then award 2 marks. cm not required for two marks.	**2** **AO2=2**

9	**Which** one **of the following is a common application of a CNC machine?** Answer: B Milling	**1** **AO1=1**

10	**What does a scale of 1:1 represent?** Answer: B Full size scale	**1** **AO1=1**

11	**Which** one **of the following are measured in candela?** Answer: C Luminous intensity	**1** **AO1=1**

12	**Use the information in** Figure 1 **to identify the** scale **and the** tolerance. Award one mark for identifying scale = 2:1 Award one mark for identifying tolerance = +/- 1mm	**2** **AO2=2**

13	**What name is given to a toothed wheel that can be used to change direction of rotation or increase and decrease speed?** Answer: B Gear	**1** **AO1=1**

14	**Three of the following would appear on a risk assessment.** **Which** one **would** not**?** Answer: C Method statement	**1** **AO1=1**

15	**Which** one **of the following statements** best **describes the mechanical property of** elasticity**?** Answer: C The property of a material to come back to its original shape and size after the load is removed	**1** **AO1=1**

16 **Explain what technological advances there have been between the two forms of commercial aircraft shown in** Figure 2 **and** Figure 3 and **discuss how these advances have impacted the modern world.**

9

AO1=3

AO2=3

AO3=3

Level	Marks	Description
3	7–9	A coherent explanation with reference to the impact of technology on the modern world. A wide range of relevant knowledge and understanding is shown, which is accurate and detailed. Subject specific terminology is used consistently throughout. Application of knowledge and understanding is appropriate, with clear relevance to the context. Analysis and evaluation are present and very effective. The conclusions drawn are fully supported by judgements.
2	4–6	A coherent explanation of what technology is but without reference to the impact on the modern world. 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. Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors. Analysis and evaluation are 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.
1	1–3	A basic explanation of technology which may not be fully accurate. 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.

				Application of knowledge and understanding is inappropriate, with any attempt showing fundamental errors. Analysis and evaluation, if present, are of limited effectiveness. Attempts to draw conclusions are seldom successful and likely to be irrelevant.	
			0	No creditworthy material	

Indicative content:

- advances in engines, power supply and the speed of travel
- efficiency of the aircraft and the capacity of the aircraft
- environmental impact/carbon footprint
- design of the aircraft

Accept any other suitable response.

17a	**Name the marking out tool shown in** Figure 4 **and state what it is used for.** Scriber (1) used to mark onto a work piece prior to being machined (1). Accept any suitable response for 'stating what it is used for' mark.	**2** **AO1=2**

17b	**Describe how you would operate the marking out tool shown in** Figure 4**.** Mark as 1x1. • Hold the scriber like a pen (1) on the rubber grip/ knurled part (1) and move it along a ruler (1) accept any straight edge tool (1) • use suitable end of scribe (1) • Hold the scribe at an angle of 45 degrees (1) move it in the direction that the scriber head is tilted (1) • use of scribe by drawing along the edge to create a marked / visible line (1) one mark for any of the above points max 4 marks marks awarded for engineering blue / marker pen(1) Accept any suitable description and development.	**4** **AO2=4**

18a	**Name** one **method of thermally joining two pieces of the same metal.** Award one mark for any of the following: • welding (any type) • soldering • brazing Accept any other suitable response.	**1** **AO1=1**

18b	**Name** one **type of mechanical fastening for joining two pieces of metal.** Award one mark for any of the following: • bolt • rivet • screwed, self tapping Accept any other suitable response.	**1** **AO1=1**

19	**Calculate the** length **and** width **of the product shown in** Figure 5**.** Length: 45+15 (1) = 60mm (1) Width 14+8+8 (1) = 30mm (1) If learner just states 60mm with no working then award 2 marks. If learner just states 30mm with no working then award 2 marks. mm not required for award.	**4** **AO2=4**

20	**Evaluate the benefits of using a sustainable material when manufacturing engineered products.** Gives a business edge (1). A unique selling point (USP) to stand out from the crowd. By establishing itself as a sustainable manufacturer, a company can promote itself as an environmentally conscious business and stand out from other companies (1) that are just there to make a profit. Consumers want to support businesses that reflect their values (1). Attract environmentally aware customers looking for more sustainable products (1). Some of them do so because they want to reduce their own environmental impact (1), while others believe that eco-friendly products have better quality or are safer in some way (1). Make a positive impact on the environment you can help conserve the earth's natural and non-renewable resources (1) and ultimately improve the state of the environment. Avoids the depletion of natural resources, by using less raw materials and more environmentally-responsible products (1), such as recycled or renewable resources (1) Accept long life of a product / long lasting (1) Accept any other suitable response.	**3** **AO3=3**

21	**Explain first angle projection.** In first angle projection we place our object in the first quadrant (1-AO1) This means that the vertical plane is behind the object (1-AO2) and the horizontal plane is underneath the object (1-AO2) Accept can see the plan(1), end (1) and side view (1) Accept any other suitable response / symbol (1). Max 3 marks	**3** **AO1=1** **AO2=2**

22	**Give** one **example of a tool used to measure a piece of metal used in engineering.** Award one mark for any of the following: • tape measure • ruler (steel) • vernier caliper • vernier height gauge • trammels • micrometer Accept any other suitable response.	**1** **AO1=1**

23	**You have been asked to make a coffee table frame from metal.** **Name** two **metals you could use to make the frame** and **give** two **examples of tools that you could use to cut to size the metals you have chosen.** Award 2x1 mark(s) for any of the following (AO1) • stainless steel • mild steel • aluminium Accept any other suitable response. Award 2x1 mark(s) for any of the following (AO2) • hack saw (junior and full size) • grinder with cutting disc (accept grinder) • band saw Accept any other suitable response.	**4** **AO1=2** **AO2=2**

24	**Name** two **SI units of measurement commonly used in engineering.** Award one mark for any of the following: • metre • kelvin • mole • ampere • time	**2** **AO1=2**

	Accept any other suitable response.	
25	**Chemical engineering has led to new products and projects which have solved problems and shaped the modern world.** **Discuss the impact of developments in chemical engineering on the modern world.**	**9** **AO1=3** **AO2=3** **AO3=3**

Level	Marks	Description
3	7–9	A coherent explanation with reference to the impact in a chemical engineering on the modern world A wide range of relevant knowledge and understanding is shown, which is accurate and detailed. Subject specific terminology is used consistently throughout. Application of knowledge and understanding is appropriate, with clear relevance to the context. Analysis and evaluation are present and very effective. The conclusions drawn are fully supported by judgements.
2	4–6	A coherent explanation of chemical engineering but without reference to the use in the modern world 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. Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors. Analysis and evaluation are 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.
1	1–3	A basic explanation of chemical engineering which may not be fully accurate 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. Application of knowledge and understanding is inappropriate, with any attempt showing fundamental errors. Analysis and evaluation, if present, are of limited effectiveness. Attempts to draw conclusions are seldom successful and likely to be irrelevant.	
		0		No creditworthy material	

Indicative content:

Problems solved

- antigenic - to provide immunity against diseases
- antiseptics - to prevent germ growth
- analgesic - to reduce pain
- food preservers - increase the life span of food
- alternative to fossil fuel eg bio-ethanol – reducing environmental impact

Impact

- lengthening life span
- improving quality of life
- reducing or removing discomfort
- reducing or avoiding the risk of spread of infectious diseases
- curing illness
- ensuring that food stays fresh longer reducing waste
- reducing levels of climate change

Accept any other suitable response.