



Rewarding Learning

**General Certificate of Secondary Education
2022**

Engineering and Manufacturing

Unit 2

assessing
Production

[GEM21]

TUESDAY 10 MAY, MORNING

**MARK
SCHEME**

General Marking Instructions

Introduction

Mark schemes are intended to ensure that the GCSE examinations are marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria which they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these general marking instructions.

Assessment Objectives

Below are the assessment objectives for GCSE Engineering and Manufacturing.

Candidates must:

- AO1** Recall, select and communicate their knowledge and understanding of engineering and manufacturing in a range of contexts;
- AO2** Apply skills, knowledge and understanding, including quality standards in a variety of design contexts. Plan and carry out investigations and making tasks involving an appropriate range of tools, equipment, materials and processes; and
- AO3** Analyse and evaluate evidence, design proposals and outcomes, make reasoned judgements and present conclusions and recommendations.

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

Flexibility in marking

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Types of mark schemes

Mark schemes for tasks or questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

COVID-19 Context

Given the unprecedented circumstances presented by the COVID-19 public health crisis, senior examiners, under the instruction of CCEA awarding organisation, are required to train assistant examiners to apply the mark scheme in case of disrupted learning and lost teaching time. The interpretation and intended application of the mark scheme for this examination series will be communicated through the standardising meeting by the Chief or Principal Examiner and will be monitored through the supervision period. This paragraph will apply to examination series in 2021–2022 only.

Part 1 Aluminum angle section

1 7 off 4 mm holes in staggered pitch

(i) Hole locations

4 mm holes correctly located within a tolerance of +/- 0.5 mm (7 × [2])

4 mm holes correctly located within a tolerance of +/- 1.5 mm (7 × [1])

If outside tolerance of +/- 1.5 mm [0]

(7 × [2])

[14]

(ii) Hole Diameters

Hole diameters 4 mm [1]

Hole diameters incorrect [0]

(1 × [1])

[1]

15

2 Position of the flat between the 45 degree faces (25 mm)

If within a tolerance of +/- 0.5 mm (1 × [3])

If within a tolerance of +/- 1 mm (1 × [2])

If within a tolerance of +/- 1.5 mm (1 × [1])

Outside a tolerance of +/- 1.5 mm [0]

(1 × [3])

[3]

3

3 45 degree angles (two angles)

(i) Accuracy of the angular dimension

45 Degrees within 1 degree (2 × [3])

45 Degrees within 2 degrees (2 × [2])

45 Degrees within 3 degrees (2 × [1])

Outside a tolerance of 3 degrees [0]

(2 × [3])

[6]

(ii) Offset between 45 Degree faces (5 mm)

If within a tolerance of +/- 0.5 mm (1 × [3])

If within a tolerance of +/- 1 mm (1 × [2])

If within a tolerance of +/- 1.5 mm [1 × [1])

Outside a tolerance of +/- 1.5 mm [0]

(1 × [3])

[3]

9

4 1 off 6 mm hole

(i) Hole location

6mm hole correctly located within a tolerance of +/- 0.5 mm (1 × [2])

6mm hole correctly located within a tolerance of +/- 1.5mm (1 × [1])

If outside tolerance of +/- 1.5 mm [0]

(1 × [2])

[2]

(ii) Hole Diameter

Hole diameter 6 mm [1]

Hole diameter incorrect [0]

(1 × [1])

[1]

3

5 30mm Radius

30mm radius completed to a high degree of precision (1 × [2])

30mm radius completed to a satisfactory degree of precision (1 × [1])

Radius completed to an unsatisfactory degree of precision [0]

(1 × [2])

[2]

2

**AVAILABLE
MARKS**

		AVAILABLE MARKS
6	20 mm × 20 mm Chamfer If within a tolerance of +/- 0.5 mm (2 × [3]) If within a tolerance of +/- 1 mm (2 × [2]) If within a tolerance of +/- 1.5 mm (2 × [1]) Outside a tolerance of +/- 1.5 mm [0] (2 × [3])	6
7	10mm Slot (i) Hole location 10mm hole correctly located within a tolerance of +/- 0.5 mm (1 × [2]) 10mm hole correctly located within a tolerance of +/- 1.5 mm (1 × [1]) If outside tolerance of +/- 1.5 mm [0] (1 × [2]) (ii) Hole Diameter Hole diameter 10mm [1] Hole diameter incorrect [0] (1 × [1]) (iii) Width of the slot measured at the midpoint (10 mm) If within a tolerance of +/- 0.5 mm (1 × [3]) If within a tolerance of +/- 1 mm (1 × [2]) If within a tolerance of +/- 1.5 mm (1 × [1]) Outside a tolerance of +/- 1.5 mm [0] (1 × [3]) (iv) Position of slot at open end (35 mm and 45 mm dimensions) If within a tolerance of +/- 0.5 mm (2 × [3]) If within a tolerance of +/- 1 mm (2 × [2]) If within a tolerance of +/- 1.5 mm (2 × [1]) Outside a tolerance of +/- 1.5 mm [0] (2 × [3])	12
8	135 Degree angle (i) Position of the apex at the 135 degree angle (70 mm) If within a tolerance of +/- 0.5 mm (1 × [3]) If within a tolerance of +/- 1 mm (1 × [2]) If within a tolerance of +/- 1.5 mm (1 × [1]) Outside a tolerance of +/- 1.5 mm [0] (1 × [3]) (ii) 135 Degree angle (at 70mm dimension) 135 Degrees within 1 degree (1 × [3]) 135 Degrees within 2 degrees (1 × [2]) 135 Degrees within 3 degrees (1 × [1]) Outside a tolerance of 3 degrees [0] (1 × [3])	6

			AVAILABLE MARKS
9	90 Degree cut out		
	(i) Location of 10 mm hole at apex of 90 degree cut out		
	10 mm hole correctly located within a tolerance of +/- 0.5 mm (1 × [2])		
	10 mm hole correctly located within a tolerance of +/- 1.5 mm (1 × [1])		
	If outside tolerance of +/- 1.5 mm [0]		
	(1 × [2])	[2]	
	(ii) Hole Diameter		
	Hole diameter 10 mm [1]		
	Hole diameter incorrect [0]		
	(1 × [1])	[1]	
	(iii) 90 degree angle		
	90 Degrees within 1 degree (1 × [3])		
	90 Degrees within 2 degrees (1 × [2])		
	90 Degrees within 3 degrees (1 × [1])		
	Outside a tolerance of 3 degrees [0]		
	(1 × [3])	[3]	6
10	10mm Radius		
	10 mm radius completed to a high degree of precision (1 × [2])		
	10 mm radius completed to a satisfactory degree of precision (1 × [1])		
	Radius completed to an unsatisfactory degree of precision [0]		
	(1 × [2])	[2]	2
11	Quality of finish		
	(i) Slot edges		
	Satisfactory quality of finish [2]		
	Poor quality of finish [1]		
	Edges unfinished [0]		
	(1 × [2])	[2]	
	(ii) 90 Degree cut out edges		
	Satisfactory quality of finish [2]		
	Poor quality of finish [1]		
	Edges unfinished [0]		
	(1 × [2])	[2]	
	(iii) Stepped 45 degree edges		
	Satisfactory quality of finish [2]		
	Poor quality of finish [1]		
	Edges unfinished [0]		
	(1 × [2])	[2]	6

Part 2 Acrylic

12 2 off 6 mm holes in base of part

(i) Location of 6 mm holes

Holes correctly located within a tolerance of +/- 0.5 mm [2 x 2]

Holes correctly located within a tolerance of +/- 1.5 mm [2 x 1]

If outside tolerance of +/- 1.5 mm [0]

(2 x [2])

[4]

(ii) **Hole Diameters**

Hole diameters 6 mm [1]

Hole diameters incorrect [0]

(1 x [1])

[1]

5

13 Width of the part base (80 mm)

If within a tolerance of +/- 0.5 mm [1 x 3]

If within a tolerance of +/- 1 mm [1 x 2]

If within a tolerance of +/- 1.5 mm [1 x 1]

Outside a tolerance of +/- 1.5 mm [0]

(1 x [3])

[3]

3

14 Angle of the bend (90 degrees)

90 Degrees within 1 degree [1 x 4]

90 Degrees within 2 degrees [1 x 3]

90 Degrees within 3 degrees [1 x 2]

90 Degrees within 4 degrees [1 x 1]

Outside a tolerance of 4 degrees [0]

(1 x [4])

[4]

4

15 Width of the bent part at the base (40 mm measured at two points)

If within a tolerance of +/- 1 mm [2 x 3]

If within a tolerance of +/- 1.5 mm [2 x 2]

If within a tolerance of +/- 2 mm [2 x 1]

Outside a tolerance of +/- 2 mm [0]

(2 x [3])

[6]

6

16 Position of the 6 mm hole on the bent flange

If within a tolerance of +/- 1 mm (1 x [6])

If within a tolerance of +/- 2 mm (1 x [5])

If within a tolerance of +/- 3 mm [1 x [4])

If within a tolerance of +/- 4 mm [1 x [3])

If within a tolerance of +/- 5 mm [1 x [2])

If within a tolerance of +/- 6 mm [1 x [1])

Outside tolerance of +/- 6 mm [0]

(1 x [6])

[6]

6

17 20 mm Radius

20mm radius completed to a high degree of precision (1 x [2])

20mm radius completed to a satisfactory degree of precision (1 x [1])

Radius completed to an unsatisfactory degree of precision [0]

(1 x [2])

[2]

2

AVAILABLE
MARKS

18 Quality of finish on edges of acrylic part

- Wet and dry paper finish on all of the acrylic part edges [4]
 - Wet and dry paper finish on more than 75% of the acrylic part edges [3]
 - Good quality finish with some tool marks on the acrylic part edges [2]
 - Poor quality finish with some saw and file marks on the acrylic part edges [1]
 - Rough and unfinished on the edges of the acrylic part [0]
- (1 × [4])

[4]

Total

**AVAILABLE
MARKS**

4

100