



LEVEL 1 & 2 MARKING SCHEME

SUMMER 2019

**LEVEL 1 & LEVEL 2
ENGINEERING - UNIT 3
9793/01**

INTRODUCTION

This marking scheme was used by WJEC for the 2019 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

LEVEL 1 & 2 ENGINEERING
UNIT 3 - SOLVING ENGINEERING PROBLEMS
SUMMER 2019 MARK SCHEME

Question	Answer	Marks
1. (a) (i)	<p>Two marks available.</p> <p>Takes up less space when not in use. Makes it easier to carry around when not riding the bike. Can be stored inside the house/workplace without taking up space.</p> <p>Accept any reasonable answer that is appropriate.</p>	2
(ii)	<p>Two marks available.</p> <p>To be more compact when the bike is folded up. To get up to optimum speed faster. To keep manufacturing costs down. To make the bike lighter.</p> <p>Accept any reasonable answer that is appropriate.</p>	2
(b) (i)	<p>One mark available.</p> <p>To hold the chain in place. To drive the chain forward to move the bike.</p> <p>Accept any reasonable answer that is appropriate.</p>	1
(ii)	<p>One mark available.</p> <p>To prevent mud/dirt from spraying up on the cyclists' back. Decorative feature.</p> <p>Accept any reasonable answer that is appropriate.</p>	1
(c)	<p>Two marks available.</p> <p>Tensile/Strength Toughness Weight Cost Easy to fabricate</p> <p>Accept any reasonable answer that is appropriate.</p>	2 x 1

Question	Answer	Marks
(d) (i)	<p>One mark available.</p> <p>Stainless Steel Mild steel</p>	1
(ii)	<p>One mark available.</p> <p>Aluminium</p>	1
(e)	<p>Up to 7 marks available</p> <p>1 Mark for naming the process</p> <p>1 Mark for basic sketch with no annotation</p> <p>2 Marks for a basic sketch with annotation</p> <p>3 Marks for clear sketch with clear annotations</p> <p>Up to 3 Marks for noting/describing steps that could include:</p> <p>Test fit to ensure a good fit and proper clearances. Clean both parts to remove dirt. Flux is mixed with water to produce a paste, then brushed along the joint. Assemble for brazing. Ignite the flame on the hearth, (blue flame). Heat the area to be joined together, until it becomes red-hot. Gently push a brazing rod against the joint. If the metal is at the correct temperature, the brazing rod will melt along the joint. Allow the joint to cool down.</p> <p>Accept any other appropriate steps or methods</p>	7
(f)	<p>Two marks available.</p> <p>'Quick-release mechanism' – A locking mechanism that can be opened or closed very quickly.</p> <p>The bike needs to be folded down quickly. The bike needs to be opened up quickly. A toolbox is not always to hand to get a spanner to open a nut (tools not required).</p> <p>Accept any reasonable answer that is appropriate.</p>	2

Question	Answer	Marks
(g) (i)	<p>Maintenance</p> <p>Answers could include:</p> <p>Improving longevity Ensuring health & safety Improving efficiency Saving money</p>	2 x1
(ii)	<p>Identifying one part of the bicycle to be maintained:</p> <p>Lubricating/oiling the chain. Testing the tightness of the brake cables. Check the tightness of the quick-release mechanisms. Lubricating/oiling the sprocket. Air pressure in tyres.</p> <p>Reasons</p> <p>Chain does not rust Efficiency of braking Easier to cycle Health & Safety Free movement of moving parts/mechanisms</p> <p>Accept any reasonable answer that is appropriate.</p>	<p>1</p> <p>2</p>

Question	Answer	Marks
2. (a)	<p>Can screen print with different colours. Reflective backing can be put on signs. Legibility of information at speed. Quality of finish doesn't corrode/erode, so signs stay clear to road users. Ability to manufacture large sized signs out of smaller plates. Modern road signs are designed to absorb force/crumple on impact. More fixing points makes it more secure. Accept any validated reason that answers the question.</p>	2 x 2
(b)	<p>Painted finish, so it could be prone to corrosion. Small font due to plate size. Expensive to create moulds to cast. Restriction in colours used (black and white). Expensive to transport Smaller scale of production Speed of production Fewer process in the modern road sign More difficult to install Modern posts are designed to crumple</p> <p>Accept any appropriate reason that answers the question.</p>	2
(c)	<p>Can be quick to remove the sign, when it needs replacing/updating. It's a low-cost way to attach the signs. Fast & low-cost to repair. Standardised components can be used on multiple signs. Another sign could be added.</p> <p>Aesthetic reasons. Durable to withstand being out in all weather conditions. Clips are galvanised, so won't corrode.</p> <p>Accept any validated reason that answers the question.</p>	2 x 2
(d)	<p>One mark for each named SMART material. Up to two marks for each suitable benefit.</p> <p>SMART materials could include, but not limited to: Polymorph EL panel Thermochromic paint/sheet Shape memory alloys Shape memory polymers Hydrogels D3O</p> <p>Accept any appropriate reason as a benefit to the user.</p>	6

Question	Answer	Marks
3. (a)	Equipment name – Internal callipers Use – To measure an internal measurement/diameters. Equipment name – Scriber Use – To mark lines/shapes on metal surfaces.	4 x 1
(b) (i)	Odd-leg calipers/Jenny calipers, height guage, surface guage	1
(ii)	Engineers square, engineers combination square Accept any appropriate engineering marking out tool	1
(c)	Clamp work to bed. Close safety guard. Position cutting tool near material. Switch on machine. Turn 'x' or 'z' axis wheel to move cutting tool. Coolant. Award a mark for any reasonable step, up to three marks for three consecutive steps.	3 x 1
(d)	Area of rectangle = 250mm x 100mm = 25000mm ² Area of hole = 3.14 x 2.5 ² = 19.625mm ² Area of four holes = 19.625 x 4 = 78.5mm ² Area = 25000-78.5 = 24921.5 Volume = 24921.5 x 2mm = 49843mm ³ Correct answer should be in mm ³ Accept any other appropriate mathematical process.	1 1 1 1 1
(e)	The side view should be in line, to the right of the front view. The circular hole should be on the side view. The end of the bracket should be drawn in line with the hidden detail on the front view. Correct drawing conventions used, including hidden detail on the side view. Quality of line work. Award up to 5 marks	1 1 1 1 1