

## 0171-38 Level 3 Advanced Technical Extended Diploma in Land-Based Engineering (1080)

0171-016/516 Level 3 Land-Based Engineering – Theory Exam (1)

March 2022 Mark Scheme

Q no.	Acceptable answer(s)	Guidance	Max mks	Ref
Q1	<p><b>One</b> mark per steering angle to a maximum of <b>three</b> marks.</p> <ul style="list-style-type: none"> <li>• Castor (1).</li> <li>• Camber (1).</li> <li>• Ackerman angle (1).</li> <li>• King pin inclination (1).</li> <li>• Thrust (1).</li> <li>• Toe in (1).</li> <li>• Toe out (1).</li> <li>• Steering axle inclination (1).</li> </ul>	Accept steering axle inclination.	3	354 1.2 AO1
Q2	Piston movement in the master cylinders creates pressure (1) which is passed through the balance brake valve (1) to create equal pressure (1). The fluid is then passed through to the pistons (1) which react to this pressure (1).	Accept any other relevant wording.	5	354 1.1 AO2
Q3	Pressurised air enters the chamber (1), which then pushes on the diaphragm (1), which accentuates the push rod (1), which moves the actuator/ lever arm (1).	Accept any other relevant wording.	4	354 1.1 AO2
Q4 a)	<p>Allows a low current to operate a higher current (1).</p> <p><b>Or</b></p> <p>An electro mechanical switch that uses a low current to switch a high current (1).</p>		1	355 1.3 AO1
Q4 b)	Allows electricity to flow in one direction only (1).		1	355 1.3 AO1
Q4 c)	Reduces current flow (1).		1	355 1.3 AO1
Q5 a)	When the battery discharges some of the lead from the plates (1) combines with the electrolyte to make lead sulphate (PbSO <sub>4</sub> ) (1). This builds up on the surface of the plates as crystals (1) and prevents the battery recharging (1).	Accept any other suitable wording	4	355 1.2 AO2

<b>Q5 b)</b>	Sulphate/SO <sub>4</sub> <sup>2-</sup> is expelled from the battery plates (1) and combines with some of the water in the electrolyte (1) making electrolyte/H <sub>2</sub> O SO <sub>4</sub> <sup>2-</sup> (1). As the sulphate transfers from the plates to the electrolyte (1) the plates return to their original composition/+ plate PbO <sub>2</sub> - plate Pb (1).		5	355 1.2 AO2
<b>Q6</b>	<b>One</b> mark each for any of the following, to a maximum of <b>three</b> marks. <ul style="list-style-type: none"> <li>• Parallel swathing/cutting (1).</li> <li>• Steering (1).</li> <li>• Yield mapping (1).</li> <li>• Variable application rate (1).</li> <li>• Autonomous driving (1).</li> </ul>		3	356 1.1 AO1
<b>Q7</b>	<b>One</b> mark as indicated below, to a maximum of <b>four</b> marks.  System monitors key elements of the machine and will highlight faults (1) when problems are in their initial stages of failure (1).  Information is sent back to manufacturer (1) so the machine can be remotely disabled/immobilised (1).  A service technician can be notified to attend and repair (1).	Accept any other relevant answer/wording.	4	356 1.1 AO2
<b>Q8</b>	To enable the uploading of new software to machines (1), to enable the removal of outdated software/glitches or programme errors (1). Improve operation of the scan tool (1) to include new functions (1) which enables the scanning of new machines (1).	Accept any other relevant answer/wording.  Do accept security patches.	5	356 1.6 AO2
<b>Q9 a)</b>	Gear Type/Gear (1).		1	357 1.1 AO1
<b>Q9 b)</b>	Pressure (Bar) (1). Flow (Litres/min) (1).		2	357 1.2 AO1
<b>Q9 ci)</b>	Gears form a seal (1) between teeth and pump body (1) converting rotational mechanical movement from input device into hydraulic flow (1) then delivers oil to outlet (1).	Accept any other relevant wording.	4	357 1.2 AO2
<b>Q9 cii)</b>	Provides thrust/seal to the gears (1) and provides a bearing surface (1).	Accept any other relevant wording.	2	357 1.2 AO2
<b>Q9 ciii)</b>	Creates a seal between gear teeth tips and housing (1). Houses gears and end plates (1). Contains inlet and outlet ports (1).	Accept any other relevant wording.	3	357 1.2 AO2
<b>Q10</b>	For no awardable content, award 0 marks.  <b>Band 1 (1-4 marks)</b> The candidate will provide incomplete information with a little or no discussion. There will be a limited understanding of calculations, connections wiring methods, safety devices	Indicative content: <ul style="list-style-type: none"> <li>• Health and Safety</li> <li>• Diagnostic Tests</li> <li>• Analyse findings and Results</li> </ul>	12	AO4

	<p>and additional components. There will be few, or no links made between correct wiring procedures.</p> <p>To access the higher marks in the band, candidates will attempt to use some technical information and detail but will not always be correct.</p> <p><b>Band 2 (5-8 marks)</b> The candidate will provide detailed information and demonstrating a broad understanding of calculations, connections, wiring methods, safety devices and additional components. There will be some clear links made between the correct wiring procedures.</p> <p>To access the higher marks in the band, candidates will attempt to use technical information, and which will usually be correct.</p> <p><b>Band 3 (9-12 marks)</b> The candidate will provide comprehensive information demonstrating an extensive breadth and depth of knowledge of calculations, connections, wiring methods, safety devices and additional components. Correct wiring procedures will be explained in detail, as will methods used to check safe operation.</p> <p>To access the higher marks in the band candidates will consistently use technical terms correctly and accurately.</p>			
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