



Mark Scheme (Results)

January 2018

NQF BTEC Level 1/Level 2 Firsts in
Engineering

Unit 9: Interpreting and Using
Engineering Information (21174E)

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BTEC Next Generation Mark Scheme Template

Engineering Unit 09 1801 1st Draft

Question Number	Answer	Mark
1(a)	Award one mark for each of the following up to a maximum of two marks: <ul style="list-style-type: none"> • B – Gantt chart (1) • E – Critical path analysis (1) More than two answers gain no marks.	2

Question Number	Answer	Mark				
1(b)	Award one mark for each correctly matched information type up to a maximum of two marks: <div style="text-align: center; margin: 10px 0;"> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; text-align: center;">Information Type</td> <td style="width: 50%; text-align: center;">Example of information</td> </tr> <tr> <td style="text-align: center; vertical-align: middle;"> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Dimensional detail</div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Circuit characteristics</div> </td> <td style="text-align: center; vertical-align: middle;"> <div style="display: flex; flex-direction: column; align-items: center; gap: 10px;"> <div style="text-align: right;">Current</div> <div style="text-align: right;">Countersink</div> <div style="text-align: right;">Surface texture</div> <div style="text-align: right;">Orientation</div> <div style="text-align: right;">Pattern number</div> </div> </td> </tr> </table> </div> If more than one line drawn from either information type, award no mark for that information type.	Information Type	Example of information	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Dimensional detail</div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">Circuit characteristics</div>	<div style="display: flex; flex-direction: column; align-items: center; gap: 10px;"> <div style="text-align: right;">Current</div> <div style="text-align: right;">Countersink</div> <div style="text-align: right;">Surface texture</div> <div style="text-align: right;">Orientation</div> <div style="text-align: right;">Pattern number</div> </div>	2
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Question Number	Answer	Mark
1(c)	Award one mark for any of the following, up to a maximum of two marks. <ul style="list-style-type: none"> • Damage from graffiti (1) • Tears/rips (1) • Poor folding methods/creases (1) • Spills/dirt/smudges (1) • Unauthorised amendments (1) • Burns (1) • Fading/wear over time (1) Accept any other reasonable response.	2

Question Number	Answer	Mark
2(a)(i)	Award one mark only for any of the following responses: <ul style="list-style-type: none"> • Radius (1) • Radii (1) • Rad (1) 	1

Question Number	Answer	Mark
2(a)(ii)	Award one mark only for any of the following responses: <ul style="list-style-type: none"> • Hidden detail (1) • Hidden detail line (1) 	1

Question Number	Answer	Mark
2(b)	Award one mark for either/both stages of the calculation up to a maximum of two marks if answer is included: <p>84/2 = 42 50 + 42</p> <p>Answer = 92</p> <p>Award two marks for the correct answer without showing working.</p>	2

Question Number	Answer	Mark
2(c)	Award one mark for each of the following up to a maximum of two marks: <ul style="list-style-type: none"> • C – Orthographic projection (1) • D – Installation (1) <p>More than two answers gains no marks.</p>	2

Question Number	Answer	Mark
3(a)(i)	<p>Award one mark for any of the following, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • eye protection (1) • protective gloves (1) • ear protection (1) • protective footwear (1) • use of guard (1) • face protection (1) • switch off instructions (1) • safety helmet (1) • respiratory equipment (1) • safety harness (1) • safety overalls (1) • pedestrian route (1) <p>Do not accept 'protective clothing'/'PPE'</p>	2
3(a)(ii)	<p>Only acceptable answers</p> <ul style="list-style-type: none"> • Muster point (1) • Assembly point (1) • Fire assembly/meeting point (1) • Assembly station (1) • Fire assembly station/spot (1) 	1

Question Number	Answer	Mark
3(b)	<p>Award one mark for a reason and one additional mark for appropriate expansion, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • As it may be storing dangerous chemicals (1) that could be hazardous to health (1) • The cupboard could contain flammable liquids (1) that may be explosive (1) • Could contain toxic/poisonous/irritant/biohazardous materials (1) that may require the use of PPE (1) • To indicate that only authorised personnel can access the cupboard (1) who have completed the necessary training (1) • To indicate to engineers where dangerous substances should be stored (1) to prevent unauthorised access/accidents (1) <p>Accept any other reasonable response.</p>	2

Question Number	Answer	Mark
4(a)	<p>Only acceptable answers</p> <ul style="list-style-type: none"> • Isometric (1) • Isometric drawing (1) • Isometric drg (1) 	1

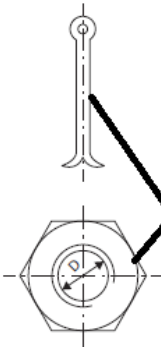
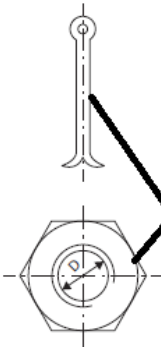
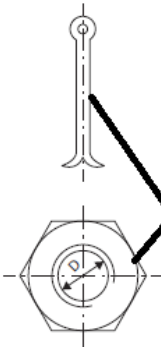
Question Number	Answer	Mark
4(b)	<p>Award one mark for any of the following, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • sequence/description of operations (1) • health and safety (1) • materials (1) • components (1) • feeds and speed (1) • tools (1) • equipment (1) • quality control checks (1) • timings (1) • order quantities (1) <p>Accept any other appropriate answer.</p>	2

Question Number	Answer	Mark
4(c)	<p>Award one mark for any of the following, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • To make sure they are using the correct type of welding filler (1) • To check the parent material grade and specification (1) • To check the acceptable plate thickness range / pipe diameter range (1) • To determine the welding position (1) • To check dimensions (1) • To check preparation requirements (1) • To check size of welding rod/wire (1) • To check energy source parameters/current required (1) • To follow correct procedures to maintain safety/prevent injury (1) • To check the correct method/technique (1) <p>Accept any other reasonable response. Do not accept responses that refer to 'following</p>	2

	procedures' without additional context/expansion.	
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Question Number	Answer	Mark
4(d)	<p>Award one mark for a reason and one additional mark for appropriate expansion, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • To remove guesswork (1) thus reducing the amount of scrap material produced (1) • Complex calculations can be avoided (1) as the values are already predetermined for the material being used (1) • To ensure improved bend consistency (1) as figures used will take into account material type and size (1) • They give a visual representation of the bend that will be produced (1) which helps with the preparation of materials for assembly purposes (1) • Drawings do not usually contain dimensions for bend radii (1) therefore a further source of information is required (1) • Bend allowance chart indicates extra material requirements (1) as bending material causes its length to shorten (1). <p>Accept any other appropriate answer</p>	2

Question Number	Answer	Mark
5(a)	<p>Award one mark for any of the following, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • Technicians will produce specific parts in the same way each time (1) • Processes will always be completed in the same order (1) • Increases flexibility as all staff can follow them (1) • Ensures the product meets the specification (1) • To avoid mistakes/injuries/danger to the user (1) • Reduces the need for training (1) • Individual and overall timings can be seen (1) • Tools/equipment can be identified (1) <p>Accept any other reasonable response.</p>	2

Question Number	Answer	Mark								
5(b)	<p>Award one mark for each correctly matched symbol to a maximum of two marks.</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Mechanical Component Symbol</th> <th style="text-align: left;">Mechanical Component Name</th> </tr> </thead> <tbody> <tr> <td rowspan="5" style="text-align: center; vertical-align: middle;">  </td> <td style="text-align: center;">Bolt</td> </tr> <tr> <td style="text-align: center;">Nut</td> </tr> <tr> <td style="text-align: center;">Spring</td> </tr> <tr> <td style="text-align: center;">Drive mechanism</td> </tr> <tr> <td style="text-align: center;">Split pin</td> </tr> </tbody> </table> <p>If more than one line drawn from either symbol, award no mark for that symbol.</p> <p style="text-align: right;">(2x1)</p>	Mechanical Component Symbol	Mechanical Component Name		Bolt	Nut	Spring	Drive mechanism	Split pin	2
Mechanical Component Symbol	Mechanical Component Name									
	Bolt									
	Nut									
	Spring									
	Drive mechanism									
	Split pin									

Question Number	Answer	Mark
5(c)	<p>Award one mark for a reason and one additional mark for appropriate expansion, up to a maximum of two marks.</p> <ul style="list-style-type: none"> • Components might not be compatible with different versions of the drill (1) which could lead to damage/unreliability/faults (1) • Allows component traceability (1) to ensure that production problems/issues can be easily rectified/modified (1) • Customers might need to replace components for older bench drills (1) meaning the drawing for that model of drill will need to be used to identify the correct components (1) • When products are recalled it is important that components are easily identifiable (1) allowing for safety improvements to be made (1) • The correct/latest drawing needs to be used in production to minimise risk (1) as changes may have been made to the drawings to 	2

	improve product safety/performance (1) Accept any other appropriate answer.	
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Question Number	Answer	Mark
5(d)	<p>Award one mark for a benefit and one additional mark for appropriate expansion, to a maximum of two marks per response, up to a maximum of four marks.</p> <p>Explain two ways that the use of Pareto charts can benefit SW3 Engineering.</p> <ul style="list-style-type: none"> • The bench drill is less likely to suffer from component failure /malfunction (1) because manufacturing methods will have been refined/problems resolved (1) • It is an efficient way of managing quality (1) as it enables the company to identify the 20% of problems that cause 80% of the issues (1) • Pareto focuses on the biggest cause of defects (1) allowing SW3 to effectively resolve them (1) • A Pareto chart gives an easily read graphic representation of quality data (1) so key issues can be easily identified (1) <p>Accept any other appropriate answer.</p>	4

Question Number	Answer	Mark
6(a)	<p>Award one mark for an advantage and one additional mark for the appropriate expansion to a maximum of two marks.</p> <ul style="list-style-type: none"> • Test reports can identify faults beginning to occur (1) therefore preventative actions can be taken (1) • Tests may indicate that equipment is functioning/performing correctly (1) removing the need for unnecessary extensive maintenance activities (1) • Test reports indicate if components are faulty/damaged/not working correctly (1) allowing these to be prepared/obtained before beginning the maintenance activities (1) • Reduces the time needed for diagnostic testing (1) as this will have already been carried out (1) • Technicians can determine how long maintenance will take to complete (1) allowing for better scheduling of work (1) <p>Accept any other reasonable response. Do not accept 'quicker' without justification.</p>	2

Question Number	Answer	Mark
6(b)	<p>Award one mark for an advantage and one additional mark for the appropriate expansion to a maximum of two marks.</p> <ul style="list-style-type: none"> • The electricity supply company will be able to access the data in real-time (1) so that they can monitor which equipment needs the most maintenance (1) • The electricity supply company can import test results/maintenance data into their own systems (1) enabling them to monitor the cost of maintenance over time (1) • The electricity supply company can use automated systems to identify common faults from test results (1) so could use these to inform changes to operating procedures (1) • The electricity supply company can access information about any vehicle instantly (1) allowing maintenance records to be accessed in the case of an accident (1) <p>Accept any other reasonable response. Do not accept 'quicker' without justification.</p>	2

Question Number	Answer	Mark
6(c)	<p>Award one mark for an advantage and one additional mark for appropriate expansion, to a maximum of two marks per response, up to a maximum of four marks.</p> <ul style="list-style-type: none"> • The electricity supply company will know how many vehicles are available for use (1) as 3RF Engineering will be maintaining a set number at any one time (1) • The electricity supply company can budget for maintenance more easily (1) as these will be a similar amount of work carried out on a regular basis (1) • There are likely to be fewer breakdowns of vehicles/ Vehicles are less likely to have faults (1) if a regular maintenance plan is used that includes preventative maintenance (1) • Vehicles will be maintained to a high level of roadworthiness/performance (1) reducing the chance of an accident or the chance of injury in the event of an accident (1) <p>Accept any other reasonable response.</p>	4

Question Number	Indicative content	Mark
7	<p>Reason for using Machinery Handbook</p> <ul style="list-style-type: none"> • To find technical information about: <ul style="list-style-type: none"> ○ sheet metal ○ shaft alignment ○ taps and tapping ○ helical coil screw thread inserts ○ solid geometry • how to distinguish between bolts and screws • for finding methods of calculating: <ul style="list-style-type: none"> ○ thread dimensions ○ keys and keyways ○ miniature screws and screw threads • to find theory about fluid mechanics. • To check strengths of materials • To check material properties • To check appropriate manufacturing processes • To check associated health and safety requirements • To find conversions between thread types • To convert units • To consult diagrams for set ups and correct machining operations • To calculate hole dimensions • To find suitable fasteners/fixings for a situation • Information about additive manufacturing • Use of measuring equipment • Specifications for consumables <p>Reason for not using Machinery Handbook</p> <ul style="list-style-type: none"> • Can be difficult to find desired information • Some older processes are not included • Some sections of the book may not be used by most engineers • Engineers may use the wrong tables to find values and then make errors • Pages can be easily damaged • Book is very thick and hard to use in a workshop • Is not specific to individual pieces of equipment/components. 	8

	<p>Model answer</p> <p>Technicians could refer to the machinery handbook for a wide range of reasons when designing and manufacturing components. For example, if they were designing and manufacturing a component to be made from medium carbon steel, with holes that need to have screw threads, they could consult the handbook to find the properties of the material, such as its strength or other mechanical properties to make sure that it is suitable for the application. They could then check the handbook for the dimensions that are needed for the holes that will be tapped. If this is a replacement part, they could also look at conversion tables when they are specifying the tap size to use to create a thread.</p> <p>When manufacturing, the technician might find it difficult to use the handbook in a workshop environment because it is so big. The pages are very thin and are easily damaged. If there are older machines in the workshop they might not be covered by new editions of the book, whilst older editions might not have more modern machinery in them. It might be difficult to find the exact information needed as there are lots of tables in the handbook and engineers could use the wrong table to find values.</p>	
Level	Descriptor	
0 0 marks	No rewardable material	
1 1-3 marks	A few key points identified, or one point described in some detail. The answer is likely to be in the form of a list. Only one viewpoint considered. Points made will be superficial/generic and not applied/directly linked to the situation in the question. Limited understanding of how the machinery handbook is used by technicians.	
2 4-6 marks	Some points identified, or a few key points described. Consideration of more than one viewpoint but there will be more emphasis on one of them. The answer is unbalanced. Most points made will be relevant to the situation in the question, but the link will not always be clear. A good understanding of how the machinery handbook is used by technicians.	
3 7-8 marks	Range of points described, or a few key points explained in depth. All sides of the case are considered and the answer is well-balanced, giving weight to all viewpoints. The majority of points made will be relevant and there will be a clear link to the situation in the question. A developed understanding of how the machinery handbook is used by technicians.	

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Welsh Assembly Government

