

1145-520 March 2018

Q	Acceptable answer(s)	Guidance	Max mks	Ref
1a)	1 mark each for 2 of: <ul style="list-style-type: none"> • Health and Safety at Work Act 1974 • Provision and Use of Work Equipment Regulations 1998 (PUWER) • Personal Protective Equipment Regulations 1992 • Control of Substances Hazardous to Health 2002 (COSHH) • Manual Handling Operation Regulations 1992 • Electricity at Work Regulations 1989 	Accept even if year not stated	2	204 1.1 AO1
1b)	1 mark each for 3 of: <ul style="list-style-type: none"> • materials • equipment • tools • time • quality checks • tolerances • activity/task/operations • sequence 	Accept any other valid answers	3	204 2.2 AO1
2a)	To provide a horizontal reference plane	Do not accept 'to stand the part on' or similar; accept 'to ensure that a part is level'	1	204 3.1 AO1
2b)	Up to 2 marks: <ul style="list-style-type: none"> • Spanner • Torque wrench 		2	204 3.2, 3.3 AO1
3	1 mark each for 2 of: <ul style="list-style-type: none"> • false cuts • burrs • sharp edges • damage • accept suitable alternative answers 		2	204 4.3 AO1
4a)	counterbore		1	205 4.3 AO1
4b)	parallelism		1	205 4.3 AO1
4c)	transformer		1	205 4.4

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				AO1
5a)	<p>1 mark each for 2 of:</p> <ul style="list-style-type: none"> To plan how long a project will take To determine the sequence of operations in a project To determine the critical path for a project To manage activities by ensuring tasks are on schedule Any other relevant response 		2	205 2.2 AO1
5b)	<p>1 mark each for 3 of:</p> <ul style="list-style-type: none"> levels of responsibility may change (1) permission may be required for some [external] activities (1) additional lines of communication may be set-up with the parent company (1) the organisation chart may be formalised with new roles in line with the characteristics of the parent company (1) The company may report to a regional/area or specialism manager at the parent company (1) any other relevant response 		3	205 1.1 AO2
6	<p>1 mark for each of the following identified points, up to 4 marks:</p> <p>Benefits</p> <ul style="list-style-type: none"> Shows all the parts or components (1) so these can be collected together to make the product (1) Shows how the parts are located in the finished product (1) so can provide guidance for assembly (1) <p>Limitation</p> <ul style="list-style-type: none"> Does not include detail on all dimensions (1) so cannot facilitate the machining of parts (1) Any other relevant response 	Award marks only for 1 benefit and 1 limitation.	4	205 4.1 AO2
7	<p>Award up to 6 marks:</p> <ul style="list-style-type: none"> A suitable material type (1), e.g. a thermoplastic, non-ferrous metal A suitable reason for its use (2 x 1 mark): e.g. corrosion resistance, lightweight, available form, ease of manufacture, recyclability etc. Suitable manufacturing process (up to 3 x 1 mark): e.g. marking out, cutting, filing, drilling etc. Any other appropriate response. 	<p>Award 1 mark for a suitable material, and up to 2 marks for reasons for its use.</p> <p>Award 1 mark for each step in the manufacturing process given, up to a maximum of 3 marks.</p> <p>Marks for the manufacturing process can be awarded even if the material recommended was not appropriate.</p>	6	AO4 203 3.1, 3.2, 3.3, 3.4, 3.5, 3.6 204 1.4, 2.2, 3.1, 3.2, 3.3, 4.1 205 3.1

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8a)	Something that causes a change in motion of an object		1	203 2.1 AO1										
8b)	Malleability		1	203 3.2 AO1										
8c)	Hardness		1	203 3.2 AO1										
8d)	1 mark each up to 2 marks: <ul style="list-style-type: none"> • Pitting • Galvanic • Oxidation/Rust 		2	203 3.4 AO1										
9a)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Mechanical test</th> <th style="text-align: center;">Property measured</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Brinell</td> <td style="text-align: center;">Hardness (1)</td> </tr> <tr> <td style="text-align: center;">Charpy</td> <td style="text-align: center;">Impact/Toughness (1)</td> </tr> <tr> <td style="text-align: center;">Wohler</td> <td style="text-align: center;">Fatigue Strength (1)</td> </tr> <tr> <td style="text-align: center;">Tensile</td> <td style="text-align: center;">Tensile Strength (1)</td> </tr> </tbody> </table>	Mechanical test	Property measured	Brinell	Hardness (1)	Charpy	Impact/Toughness (1)	Wohler	Fatigue Strength (1)	Tensile	Tensile Strength (1)	One mark for each cell completed with accurate information.	4	203 3.3 AO1
Mechanical test	Property measured													
Brinell	Hardness (1)													
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Wohler	Fatigue Strength (1)													
Tensile	Tensile Strength (1)													
9b)	Up to 4 marks: <ul style="list-style-type: none"> • Grain growth occurs in the microstructure • Atoms migrate within the crystal lattice reducing the number of dislocations • Reduces the hardness • Increases the ductility so it can be deformed more easily 	Any other appropriate response	4	203 3.5 AO2										
10a)	$A = 75 / (\sin(\tan^{-1}(75/100))) = 125 \text{ mm}$	Accept Pythagoras methods Using Pythagoras Theorem, $A = \sqrt{B^2+C^2}$ $= \sqrt{100^2+75^2} = 125 \text{ mm}$	2	203 1.3 AO2										
10b)	1 mark per line up to 4 marks: Rearranging eqn(1) $x = 26 - 4y$ Substituting this into 2 : $52 - 8y + 3y = 27$ Rearranging and resolving $52-27 = 25 = 5y$ hence $y = 5$ Inserting this into (1) therefore $x = 6$	Accept alternate routes	4	203 1.4 AO2										
11a)	Up to 3 marks: $= 1 / 6000 + 1 / 2000 = 4 / 6000$ therefore $R_T = 1500 \Omega$	1 mark for use of correct denominator, 1 mark for correct value	2	203 2.2 AO2										

11b)	$V = IR$ $= 0.006 \times 1500 = 9 \text{ volts}$	Allow marks if incorrect value for resistance is carried forward from a)	2	203 2.2 A02
12	<p>Intention: <i>To elicit responses that demonstrate how knowledge and understanding across the full range of technical content of the applied units relate to the question context. For example, this may involve application of knowledge and understanding of how the material selection affects the overall cost and manufacturing options, and how the scale of manufacture affects process selection.</i></p> <p>Level 1 (1-3 marks) Descriptive response based on recall of knowledge, relating only to a single consideration, e.g. automation of machining processes or ease of manufacture of materials. Candidates at the top of this level may be characterised by showing some understanding of one effect of manufacturing volume on material or process selection.</p> <p>Level 2 (4-6 marks) Mainly descriptive response showing knowledge recall relating to a range of different factors affecting the choice of materials and manufacturing process. Candidates at the top of this level may demonstrate understanding of a range of reasons for how or why manufacturing volume effects material or process selection.</p> <p>Level 3 (7-9 marks) Detailed response, showing both knowledge recall and understanding of how both material and process choice could be affected by a wide variety of different contributing factors. Candidates at the top of this level may be characterised by considering the relative impact of different types of factor on the selection of the material and the process.</p>	<p>Indicative content:</p> <ul style="list-style-type: none"> • Influence of material form on selection to minimise machining requirements • Influence of material properties on machining characteristics, such as hardness. • Material cost (direct and manufacturing) • Differences between make to order and mass production • Influence of the scale of manufacture on process selection • Consideration of manufacturing tolerances <p><i>For no awardable content, award 0 marks.</i></p>	9	A04 203 3.1, 3.2, 3.3, 3.5, 3.6 204 1.1, 1.2, 1.4, 2.1, 2.2, 3.1, 3.2, 3.3, 4.1, 4.2, 4.3 205 1.1, 1.2, 2.2, 3.1, 3.2, 4.1, 4.2