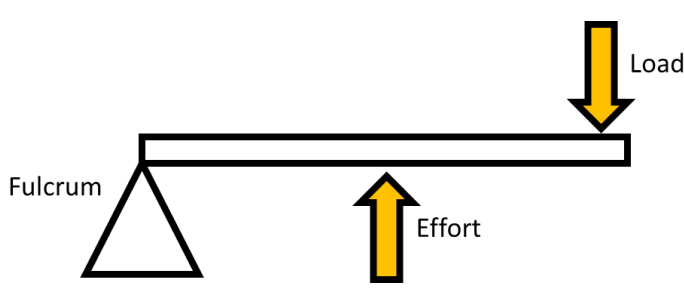


1145-21 Level 2 Technical Certificate in Engineering
 1145-520 Level 2 Engineering - Theory exam

March 2022 Mark Scheme

Q no.	Acceptable answer(s)	Guidance	Max mks	Ref
Q1	1 mark for each correct answer: a) Mandatory (1) b) Safe condition/no danger (1) or informational/emergency escape/ first aid (1) c) Warning (1)/indicator of a general hazard or danger (1)		1 1 1	204 1.3 AO1
Q2 a)	1 mark for each of the following, up to a maximum of 2 marks : <ul style="list-style-type: none"> • To check they are within tolerance (1) • To check they meet the specification criteria (1) • To check the dimensions are correct (1) • To check that the output is correct (1) • To check consistency of manufacture (1) • To check products are safe to use (1) • Checking quality of surface finish (1) • Any other suitable response. 		2	204 4.3 AO1
Q2 b)	1 mark for each relevant point, up to a maximum of 2 marks . For example: <ul style="list-style-type: none"> • Inspection that uses raw sight (1) without the use of specialised inspection equipment (1). • Any other relevant point. 		2	204 4.3 AO1
Q3	1 mark for each relevant point up to a maximum of 3 marks . For example, using a desoldering pump: <ul style="list-style-type: none"> • Heat the solder with a soldering iron until it melts (1). • Place the tip of the desoldering tool over the melted solder (1). • Push the pump button downwards (1) • Press the release button to vacuum up the solder (1) • Any other relevant point. 	Candidates may describe an alternative method, such as the use of desoldering braid.	3	204 3.2 AO1
Q4 a)	1 mark for countersink.		1	205 4.3 AO1

Q no.	Acceptable answer(s)	Guidance	Max mks	Ref
Q4 b)	<p>i) 1 mark for battery.</p> <p>ii) 1 mark for lamp/bulb</p>	i) do not accept cell on its own.	1 1	205 4.4 AO1
Q5 a)	<p>1 mark for each of the following, up to maximum of 2 marks:</p> <ul style="list-style-type: none"> • Industry (1) • National (1) • International (1) • Health and Safety (1) • Environmental (1) • Materials (1) • Quality (1) • Performance (1) • Manufacturing (1) • Internal (1) • External (1) • Any other appropriate response 	Marks may also be awarded if specific standards or types of standards are given. E.g. British Standards.	2	205 1.4 AO1
Q5 b)	<p>1 mark for each relevant point, up to maximum of 3 marks: For example:</p> <ul style="list-style-type: none"> • They ensure commonality of communication/methods/products (1) which ensures that products/systems are compatible with each other (1). • Ensures that products are appropriate for their intended use (1). • To ensure workplaces are safe (1) • To ensure purchasers can have confidence in the materials they are buying (1) • To facilitate compatibility between diff sources/suppliers (1) • To provide independent reference points for performance (1) • To reduce environmental damage (1) • To meet requirements of the international market (1) • To ensure consistency of products/processes/parts (1) • Any other relevant response. 	Answer must be an explanation to gain full marks.	3	205 1.4 AO2
Q6	<p>1 mark each up to 4 marks:</p> <ul style="list-style-type: none"> • Components/ materials are ordered only when they are needed (1) thus reducing the cost of storage (1). • Materials are not left in storage for long periods (1), resulting in less wastage (1). • If a supply problem occurs there will be no materials/components available for use (1) which could result in production having to be stopped (1). • Any other suitable response. 	1 mark each for any suitable characteristic and 1 mark each for explanation.	4	205 3.1 AO2

Q no.	Acceptable answer(s)	Guidance	Max mks	Ref
Q7	<p>Award up to 6 marks:</p> <ul style="list-style-type: none"> • A suitable material type (1), e.g. an appropriate ferrous or non-ferrous metal. • Suitable specific reasons for its use (2 x 1 mark): e.g. strength, hardness, ease of manufacture, cost, availability etc. • Suitable manufacturing process (up to 3 x 1 mark): e.g. marking out, cutting using an appropriate named process, bending, filing, drilling, welding etc. • Any other appropriate response. 	<p>Award 1 mark for a suitable material, and up to 2 marks for reasons for its use. Steel and aluminium acceptable as the named material.</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, 3.4, 3.5, 3.6 204 1.2, 2.1, 2.2 3.1 3.2 3.3 4.2 4.3 205 1.4 3.1
Q8 a)	<p>1 mark for each relevant point, up to maximum of 2 marks. For example:</p> <ul style="list-style-type: none"> • The energy required to change the state of a material (1) from solid to liquid/liquid to vapour (1) without a resultant change in temperature (1). • Any other relevant point. 		2	203 2.1 AO1
Q8 b)	<p>1 mark each for showing or stating a load, effort and/or fulcrum either explicitly or in the context of the described example, up to a maximum of 2 marks.</p> <p>1 mark for showing or describing the correct relative position of load, effort and fulcrum.</p> <p>1 mark for stating an appropriate example.</p> <p>Any other appropriate response.</p> <p>For example:</p> 		4	203 2.2 AO1
Q8 c)	Voltage = Current x Resistance	Definition may be given in words or using the formula.	1	203 2.2 AO1

Q no.	Acceptable answer(s)	Guidance	Max mks	Ref
Q9 a)	1 mark for each of the following: <ul style="list-style-type: none"> • Ferrous metals contain iron. (1) • Non-ferrous metals do not contain iron. (1) • Any other suitable response. 		2	203 3.1 AO1
Q9 b)	1 mark for each relevant point, up to maximum of 4 marks . For example: <ul style="list-style-type: none"> • Achieved by heating the workpiece to below its lower critical temperature (1), resulting in relaxation of internal stresses (1). • Increased toughness/ decreased brittleness (1). • Decreased hardness (1). • Increased ductility (1). • Any other relevant point. 	Answer must be an explanation to gain full marks.	4	203 3.5 AO2
Q10 a)	Rearranging $x = (12 - 6)/2$ (1) $x = 3$ (1)	1 mark for method, 1 mark for answer.	2	203 1.4 AO2
Q10 b)	Area of the rectangular section = $l \times w = 55 \times 35$ (1) $= 1925 \text{ mm}^2$ (1) Area of the triangle = $bh/2 = 55 \times 35 / 2$ (1) $= 962.5 \text{ mm}^2$ (1) Total area = $1925 + 962.5 = 2887.5 \text{ mm}^2$ (1)	Correct units do NOT need to be stated to be awarded for the total area. Award mark for methodology for stating either the formula or the working. Alternative suitable methods would be acceptable.	5	203 1.2 AO2
Q11 a)	Gear ratio = $20 / 60$ (1) Gear ratio = 1:3 (1)	1 mark for method. 1 mark for answer. Only award full marks if answer given in lowest denominator.	2	203 2.2 AO2
Q11 b)	1 mark maximum for either of the following: <ul style="list-style-type: none"> • To change the speed of rotation (1). • To change the torque transferred (1). • Any other relevant point. 		1	203 2.2 AO2

Q no.	Acceptable answer(s)	Guidance	Max mks	Ref
Q12	<p>For no awardable content, award 0 marks.</p> <p>Level 1 (1-3 marks) Descriptive response based on recall of knowledge, relating only to a single consideration. Candidates at the top of this level may be characterised by showing some understanding of one effect of safety on an engineering activity, such as the precautions needed when using cutting tools.</p> <p>Level 2 (4-6 marks) Mainly descriptive response showing knowledge recall, relating to how a -few different safety considerations affect an engineering activity. Candidates at the top of this level may demonstrate understanding of a few reasons for how or why safety affects the activities completed by an engineering business.</p> <p>Level 3 (7-9 marks) Detailed response, showing both knowledge recall and understanding of how a range of safety considerations could influence a variety of engineering activities. Candidates at the top of this level may be characterised by considering the relative impact of different safety considerations on engineering activities.</p>	<p>Indicative content:</p> <ul style="list-style-type: none"> • Completion of risk assessments for activities conducted by the business. • Employee responsibilities under health and safety legislation. • Completion of procedures for safe working practice, such as isolating energy sources. • Consideration of health and safety when planning workshop activities. • Safe use of workshop tools and equipment e.g. wearing PPE, putting down guards etc. • Consideration of fire safety, manual handling, vibration requirements. • Use of visual inspection to check products are free from sharp edges or other defects that could make them unsafe. • Cost of training workers and purchasing safety equipment. • Communication of safety procedures to workers using different methods. • Selection of appropriate materials, components etc to 	9	203 2.2 3.1 3.2 3.3 3.6 204 1.1 1.2 1.4 2.2 3.1 3.2 3.3 4.1 4.3 205 1.4 2.1 AO4

		<p>ensure products meet safety standards.</p> <ul style="list-style-type: none">• Ensuring calculations are correct so that products/components function in a safe manner. E.g. calculating appropriate power supply voltages. <p>Any other appropriate response.</p>		
--	--	---	--	--