Lesson M2 Review Questions

Selecting Materials



Answer every question in your jotter. Show your working. Tap a question below to go to it. Tap **Show answer** under a question to mark it.

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Questions

2023 Section 2 Question 11 (d)

1. The properties of the four metals considered for the support structure are shown in the table below.

Metal	Corrosion resistant	Durability
A	no	low
B	yes	high
C	yes	low
D	no	high

Select the most suitable metal (A–D) from the table above to be used for the support structure and justify your choice. **2**

Choice of metal _____

Justification _____

_____

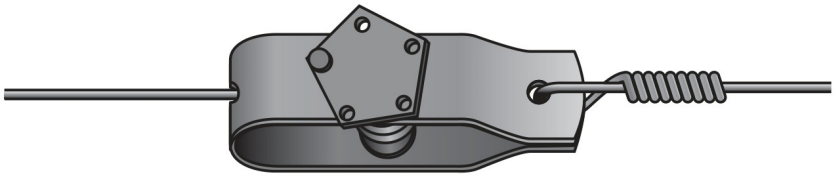
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Show answer ›

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2. A tensioner is used to tighten the wire on a farm fence.



A 25 m length of wire was stretched by 0.012 m when fully tensioned.

(a) Calculate the strain in the wire. **2**

The table below shows details of materials that were considered for the wire.

Material	Corrosion resistant	Property
A	no	ductile
B	yes	brittle
C	yes	ductile
D	no	brittle

(b) Select the most suitable material (A–D) from the table for the wire and justify your choice. **2**

Choice of material _____

Justification _____

_____

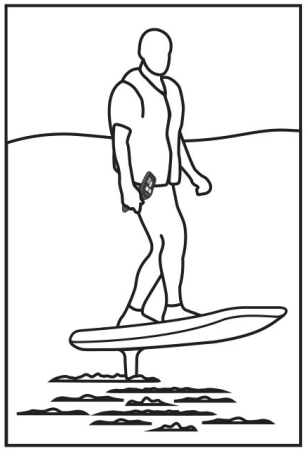
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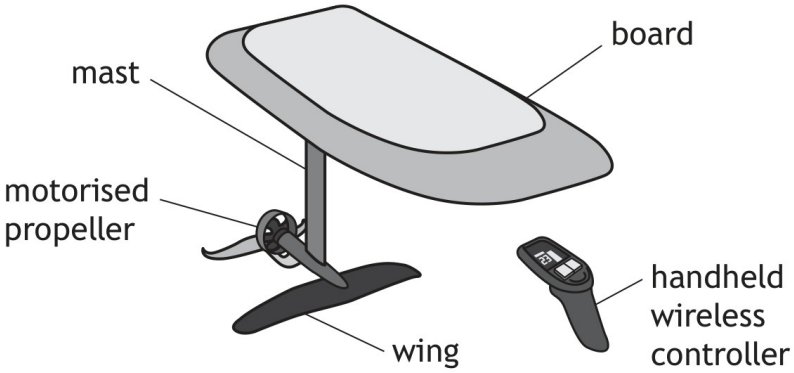
Show answer ›

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3. A hydrofoil board allows a rider to glide over water.

The hydrofoil board and handheld wireless controller are shown.





The hydrofoil board is to be used in the sea and must be able to withstand a range of different forces.

The properties of four materials considered for the mast are shown in the table below.

Material	Corrosion resistant	Strength
A	yes	low
B	no	high
C	yes	high
D	yes	medium

(a) Select, from the table, the most suitable material to be used for the mast and justify your choice. **2**

Selected material _____

Justification _____

_____

_____

Show answer ›

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4. The properties of four materials considered for the cable holding the rider are shown in the table below.

Material	Maximum force	Performs best in	Corrosion resistant
A	7200 N	compression	no
B	7200 N	tension	no
C	7200 N	compression	yes
D	7200 N	tension	yes

Select the most suitable material from the table to be used for the support cable and justify your choice. **2**

Choice of material _____

Justification for choice _____

_____

_____

Show answer ›

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5. A maximum of two acrobats can hang from the trapeze swing at any one time. When this happens the forces in support wires S1 and S2 are as follows:

S1 = 1300N **S2 = 930N**

The table below shows materials that were considered for the support wires.

	Material A	Material B	Material C	Material D
Maximum tensile load	1000 N	1300 N	3250 N	4500 N
Durability	High	Low	High	Low

Select the most suitable material (A-D) from the table above to be used for the support wires and justify your choice. **2**

Choice of material _____

Reason for choice _____

_____

_____

_____

Show answer ›

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6. The sign hangs on a metal support. The following materials were considered for the support during the design of the sign.

Material	Maximum Tensile Load	Maximum Compressive Load	Corrosion Resistant
Metal A	4·8 kN	4·8 kN	Yes
Metal B	5·6 kN	5·1 kN	Yes
Metal C	3·6 kN	5·5 kN	No
Metal D	5·2 kN	6·2 kN	No

Select the most suitable metal (A-D) from the table to be used for the support and justify your choice. **2**

Choice of metal _____

Reason for choice _____

_____

_____

Show answer ›

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7. An electric guitar is shown in the photograph below.



Tuning a guitar string produces an 80 N tensile load in the string.

The table below gives the properties of three alloys that could be used to make a guitar string.

Alloy	Maximum load	Brittle/ductile
A	120 N	Brittle
B	90 N	Ductile
C	65 N	Ductile

(a) (i) State which alloy (A–C) would be most appropriate for the guitar string. _____ **1**

(ii) Explain, with reference to the table, your choice of alloy. **1**

_____

_____

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The guitar string has a cross-sectional area of $0{\cdot}2\,mm^2$.

(b) Calculate the stress in the guitar string. **2**

Show answer ›

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Answers

Check your understanding (booklet)

1 Ferrous metals.

2 It does not rust or corrode.

3 It bends or stretches without snapping.

4 Corrosion resistant.

5 Its maximum load is less than the 4 kN force (cause), so it would fail (effect).

Answer to question 1

2023 Section 2 Question 11 (d)

Marking instructions

Question	Expected response	Max mark	Additional guidance
(d)	B Metal B is corrosion resistant and is (more) durable. Metal B because the structure will be used outside and it is corrosion resistant. Metal B because it is durable and so parts will not need to be replaced often.	**2**	1 mark for metal B. 1 mark for corrosion resistant **and** durable. **OR** 1 mark for a property with valid rationale based on selection. Apply FTE from metal selection.

‹ Back to question 1

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Answer to question 2

2022 Section 1 Question 5

Marking instructions

Question			Expected response	Max mark	Additional guidance
5.	(a)		$\varepsilon = \frac{\Delta l}{l}$ $\varepsilon = \frac{0.012}{25}$ ε = **0.00048 (2 sf)**	2	1 mark for substitution. 1 mark for correct answer from given working. Ignore any unit.
	(b)		(material) C it is corrosion resistant and it is ductile/not brittle it is resistant to corrosion because it will be used outside it is ductile and so it will not snap	2	1 mark for material C. 1 mark for identification of both properties or justification of one. Do not accept strong. Allow FTE from chosen material.

‹ Back to question 2

Answer to question 3

2024 Section 2 Question 13 (c)

Marking instructions

Question			Expected response	Max mark	Additional guidance
	(c)		C It is corrosion resistant (against the water) and high strength (resisting the range of forces acting on it).	2	1 mark for selecting material C. 1 mark for justification that includes reference to corrosion resistant and high strength. Do not accept strong.

‹ Back to question 3

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Answer to question 4

2021 Section 2 Question 11 (c)

Marking instructions

Question	Expected response	Max mark	Additional guidance
(c)	D Performs best in tension and is corrosion resistant.	2	1 mark for choice of material. 1 mark for justification with reference to tension and corrosion resistant.

‹ Back to question 4

Answer to question 5

2018 Section 2 Question 11 (d)

Marking instructions

Question	Expected response	Max mark	Additional guidance
(d)	Material C It is durable **and** will support the (1300N) load It is strong (enough) to support the acrobats and it is durable	2	1 mark for correct material 1 mark for justification in terms of durability and tensile load/ strength

‹ Back to question 5

Answer to question 6

2017 Section 2 Question 14 (b)

Marking instructions

Question	Expected Answer(s)	Max Mark	Additional Guidance
(b)	Metal **B** The maximum tensile load (5·6 kN) exceeds the (5·2 kN) weight of the sign **and** it is corrosion resistant as the sign will be outdoors.	2	1 mark metal choice 1 mark for reason including reference maximum tensile load **and** corrosion resistance. Accept highest tensile load but not high tensile load with corrosion resistance.

‹ Back to question 6

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Answer to question 7

2017 Specimen Section 2 Question 14 (a)(i), (a)(ii), (b)

Marking instructions

Question			Expected response	Max mark	Additional guidance
14	a	i	B	1	
14	a	ii	It is strong enough to support the load and will bend as appropriate.	1	Explanation must refer to both relevant points (load support and bending).
14	b		Stress = Force/Area = 80 N/0·2 (1 mark for substitution) = 400 N mm^{-2} (1 mark for correct answer from candidate's working)	2	

‹ Back to question 7

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