

Rewarding Learning

ADVANCED SUBSIDIARY (AS) General Certificate of Education 2018

Mathematics

Assessment Unit M1 assessing Module M1: Mechanics 1

Centre Number

Candidate Number

AMM11

[AMM11] TUESDAY 29 MAY, MORNING

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer all seven questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. Do not write with a gel pen.

Questions which require drawing or sketching should be completed using an H.B. pencil. All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions. **Answers without working may not gain full credit**.

Answers should be given to three significant figures unless otherwise stated.

You are permitted to use a graphic or scientific calculator in this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

A copy of the Mathematical Formulae and Tables booklet is provided.

Throughout the paper the logarithmic notation used is $\ln z$ where it is noted that $\ln z \equiv \log_e z$

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		Take $g = 9.8 \text{ m s}^{-2}$, unless specified otherwise.
1	A b of 1 The Mo	all of mass 0.25 kg falls vertically and hits horizontal ground with a speed 1 ms^{-1} e ball rebounds vertically with a speed of 7 ms^{-1} del the ball as a particle.
	(i)	Find the impulse exerted on the ball by the ground during the impact. [3]
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Dur	During the impact, the average force between the ball and the ground is 40 N.						
(ii)	Find the length of time for which this impact lasts.	[2]					
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2 Parcels are being loaded from a storage shelf onto a trolley 2.5 m vertically below the shelf.

Kate releases a parcel from rest and it falls vertically 2.5 m onto the trolley, as shown in **Fig. 1** below.





(i) Calculate the time taken for this parcel to fall onto the trolley. [3] _____ **Turn over** 11106

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Noticing that parcels are often damaged when they are loaded this way, Kate constructs a ramp so that the parcels can slide onto the trolley as shown in **Fig. 2** below.





The ramp is inclined at an angle of 60° to the vertical, and the coefficient of friction between the ramp and the parcel is 0.2 A parcel of mass 2 kg is released down the slope.

(ii) In the space below draw a diagram showing the external forces acting on this parcel.

[2]

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3 A non-uniform plank AB of length 4 m and mass 16 kg is pivoted at its midpoint. Two girls, Sara and Eleanor, have mass 25 kg and 30 kg respectively. Sara stands at end A of the plank and Eleanor stands at end B, as shown in **Fig. 3** below.



The plank rests in equilibrium.

The distance of the centre of mass of the plank is *x* metres from A. Model the two girls as particles.

(i) In the space below draw a diagram showing the external forces acting on the plank.

[2]

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) State one modelling assumption you have made about the plank.	[
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- Two particles P and Q, of masses 4 kg and 6 kg respectively, are connected by a light 4 inextensible string. The string passes over a smooth fixed pulley. Initially, P and Q are at the same level and are held at rest 2 m above a horizontal plane. The system is released from rest. (i) On the diagram below show the external forces acting on P and Q. [2] Р Q

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m)	Find the velocity of P as Q hits the ground.

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5	The velocity v	ms^{-1} of a	particle at time	<i>t</i> seconds is	given by
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(i)	Find the initial displacement of the particle from O.	
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(ii)	Find the distance the particle travels from its initial position until it changes its direction of motion. [5]
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(iii) Find the acceleration of the particle when $t = 5$	[.

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(Questions continue overleaf)

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s shown in Fig. 4 be	elow.
3	
$\theta = \frac{3}{4}$ ne.	
plank is uniform.	[1]
forces acting on	[2]

6 A wooden plank AB has mass 4m and length 4a. A force of magnitude T acts at right angles to the plank at B a _ 4*a* A^{k} Fig. 4 The end A is freely hinged to horizontal ground. The plank makes an angle of θ with the horizontal, where tan The plank is modelled as a uniform rod lying in a vertical pla (i) State how you will use the modelling assumption that the (ii) In the space below draw a diagram showing the external the plank.

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Find T in terms of m and g.	[4
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7	Alan and Bill are in their cars and both cars are travelling at 18ms^{-1} in the same direction along a straight horizontal road. At time $t = 0$ seconds, Bill is 14.5 metres ahead of Alan. At $t = 0$, Bill starts to brake with a constant retardation of 6 ms^{-2} At $t = 0.5$ seconds, Alan starts to brake with a constant retardation of 4 ms^{-2}	
	(i) On the axes below sketch the velocity–time graphs for the two cars.	[3]
	ν↑	
		\overrightarrow{t}
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[9	nd the value of <i>t</i> at which the cars collide.
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Marks

Examiner Number

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