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Candidate surname					Other names								
Pearson Edexcel International Advanced Level					Centre Number					Candidate Number			
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Thursday 11 June 2020													
Afternoon (Time: 1 hour 30 minutes)						Paper Reference WME03/01							
Mathematics International Advanced Subsidiary/Advanced Level Mechanics M3													
You must have: Mathematical Formulae and Statistical Tables (Blue), calculator										Total Marks			

Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Whenever a numerical value of g is required, take $g = 9.8 \text{ m s}^{-2}$, and give your answer to either two significant figures or three significant figures.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 7 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

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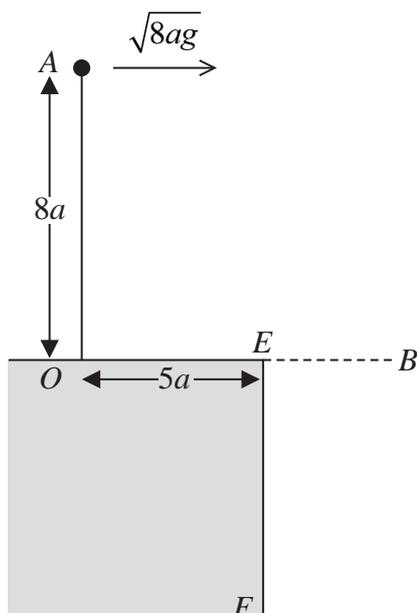


Figure 5

A particle of mass m is attached to one end of a light inextensible string of length $8a$. The other end of the string is fixed to the point O on the smooth horizontal surface of a desk. The point E is on the edge of the desk, where $OE = 5a$ and OE is perpendicular to the edge of the desk. The particle is held at the point A , vertically above O , with the string taut.

The particle is projected horizontally from A with speed $\sqrt{8ag}$ in the direction OE , as shown in Figure 5.

When the particle is above the level of OE the particle is moving in a vertical circle with radius $8a$.

Given that, when the string makes an angle θ with the upward vertical through O , the tension in the string is T ,

(a) show that $T = 3mg(1 - \cos \theta)$ (7)

At the instant when the string is horizontal, the particle passes through the point B .

(b) Find the instantaneous change in the tension in the string as the particle passes through B . (3)

The particle hits the vertical side EF of the desk and rebounds. As a result of the impact, the particle loses one third of the kinetic energy it had immediately before the impact.

In the subsequent motion the string becomes slack when it makes an angle α with the upward vertical through O .

(c) Show that $\cos \alpha = \frac{7}{12}$ (7)



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