

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				

Pearson Edexcel International Advanced Level

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 (Yellow), 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.

Turn over ►

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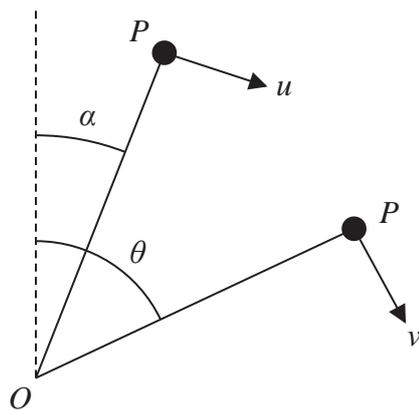


Figure 3

A light rod of length a is free to rotate in a vertical plane about a horizontal axis through one end O . A particle P of mass m is attached to the other end of the rod. The particle P is held at rest with the rod making an angle α with the upward vertical through O ,

where $\tan \alpha = \frac{3}{4}$

The particle P is then projected with speed u in a direction which is perpendicular to the rod. At the instant when the rod makes an angle θ with the upward vertical through O , the speed of P is v , as shown in Figure 3.

Air resistance is assumed to be negligible.

(a) Show that $v^2 = u^2 + \frac{2ag}{5}(4 - 5\cos\theta)$ (4)

It is given that $u^2 = \frac{6ag}{5}$ and P moves in complete vertical circles.

When $\theta = \beta$, the force exerted on P by the rod is zero.

(b) Find the value of $\cos\beta$ (6)

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7. [You may assume that the volume of a cone of height h and base radius r is $\frac{1}{3} \pi r^2 h$.]

A uniform solid right circular cone C , with vertex V , has base radius r and height h .

- (a) Show that the centre of mass of C is $\frac{3}{4}h$ from V (4)

A solid F , shown below in Figure 4, is formed by removing the solid right circular cone C' from C , where cone C' has height $\frac{1}{3}h$ and vertex V

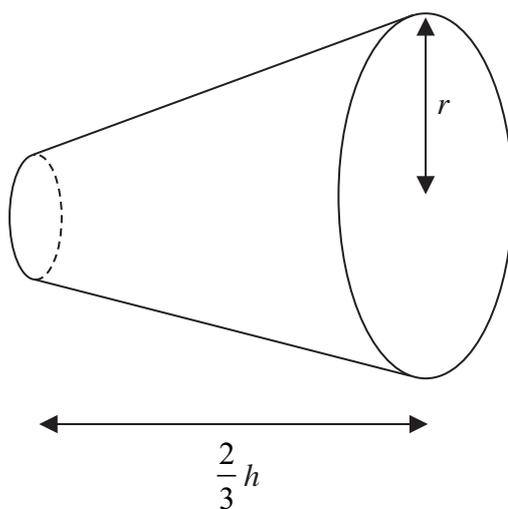


Figure 4

- (b) Show that the distance of the centre of mass of F from its larger plane face is $\frac{3}{13}h$ (5)

The solid F rests in equilibrium with its curved surface in contact with a horizontal plane.

- (c) Show that $13r^2 \leq 17h^2$ (5)

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