

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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Q:1/1/



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1. A particle P moves in a straight line with simple harmonic motion between two fixed points A and B . The particle performs 2 complete oscillations per second. The midpoint of AB is O and the midpoint of OA is C

The length of AB is 0.6 m.

- (a) Find the maximum speed of P (4)
- (b) Find the time taken by P to move directly from O to C (2)

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2.

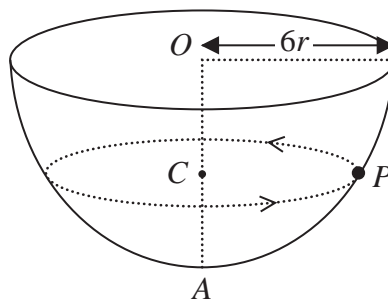


Figure 1

A hemispherical bowl of internal radius $6r$ is fixed with its circular rim horizontal. The centre of the circular rim is O and the point A on the surface of the bowl is vertically below O . A particle P moves in a horizontal circle, with centre C , on the smooth inner surface of the bowl. The particle moves with constant angular speed $\sqrt{\frac{g}{4r}}$. The point C lies on OA , as shown in Figure 1.

Find, in terms of r , the distance OC

(9)

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3.

In this question you must show all stages of your working.

Solutions relying entirely on calculator technology are not acceptable.

A particle P is moving along a straight line.

At time t seconds, P is a distance x metres from a fixed point O on the line and is

moving away from O with speed $\frac{50}{2x+3} \text{ m s}^{-1}$

(a) Find the deceleration of P when $x = 12$ (5)

Given that $x = 4$ when $t = 1$

(b) find the value of t when $x = 12$ (5)

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7.

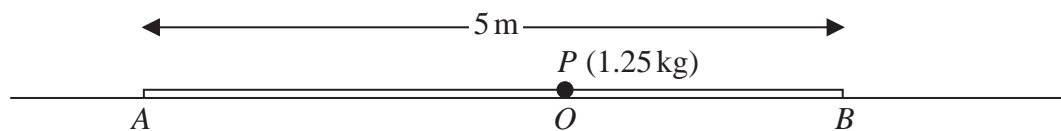


Figure 5

Figure 5 shows two fixed points, A and B , which are 5 m apart on a smooth horizontal floor.

A particle P of mass 1.25 kg is attached to one end of a light elastic string, of natural length 2 m and modulus of elasticity 20 N. The other end of the string is attached to A

A second light elastic string, of natural length 1.2 m and modulus of elasticity λ newtons, has one end attached to P and the other end attached to B

Initially P rests in equilibrium at the point O , where $AO = 3$ m

(a) Show that $\lambda = 15$ (3)

The particle is now projected along the floor towards B

At time t seconds, P is a displacement x metres from O in the direction OB

(b) Show that, while both strings are taut, P moves with simple harmonic motion where $\ddot{x} = -18x$ (4)

The initial speed of P is 10 m s^{-1}

(c) Find the speed of P at the instant when the string PB becomes slack. (3)

Both strings are taut for T seconds during one complete oscillation.

(d) Find the value of T (6)

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