Centre No.			Paper Reference				Surname	Initial(s)			
Candidate No.			6	6	7	9	/	0	1	Signature	

Paper Reference(s)

### 6679/01

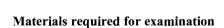
# **Edexcel GCE**

### **Mechanics M3**

## Advanced/Advanced Subsidiary

Friday 6 June 2008 – Afternoon

Time: 1 hour 30 minutes



Items included with question papers

N:

Mathematical Formulae (Green)

Candidates may use any calcula

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

#### **Instructions to Candidates**

In the boxes above, write your centre number, candidate number, your surname, initials and signature. Check that you have the correct question paper.

Answer ALL the questions. Write your answers in the spaces provided in this question paper. If you need more space to complete your answer to any question, use additional answer sheets. Whenever a numerical value of g is required, take g = 9.8 m s<sup>-2</sup>.

When a calculator is used, the answer should be given to an appropriate degree of accuracy.

#### **Information for Candidates**

A booklet 'Mathematical Formulae and Statistical Tables' is provided.

Full marks may be obtained for answers to ALL questions.

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).

There are 6 questions in this question paper. The total mark for this question paper is 75.

There are 24 pages in this question paper. Any blank pages are indicated.

### **Advice to Candidates**

You must ensure that your answers to parts of questions are clearly labelled. You should show sufficient working to make your methods clear to the Examiner. Answers without working may not gain full credit.

This publication may be reproduced only in accordance with Edexcel Limited copyright policy. ©2008 Edexcel Limited.

N29501A



Turn over

Total





1 2 3 4

Examiner's use only

Team Leader's use only

5

\_\_\_\_\_

1.

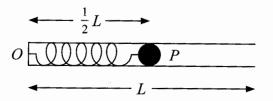


Figure 1

A light elastic spring, of natural length L and modulus of elasticity  $\lambda$ , has a particle P of mass m attached to one end. The other end of the spring is fixed to a point O on the closed end of a fixed smooth hollow tube of length L.

The tube is placed horizontally and P is held inside the tube with  $OP = \frac{1}{2}L$ , as shown in Figure 1. The particle P is released and passes through the open end of the tube with speed  $\sqrt{(2gL)}$ .

(a) Show that  $\lambda = 8mg$ .

**(4)** 

The tube is now fixed vertically and P is held inside the tube with  $OP = \frac{1}{2}L$  and P above O. The particle P is released and passes through the open top of the tube with speed u.

(b) Find u.

**(5)** 




(Total 9 marks)

2.	A particle $P$ moves with simple harmonic motion and comes to rest at two point which are 0.24 m apart on a horizontal line. The time for $P$ to travel from $A$ to $A$ . The midpoint of $AB$ is $AB$ . At time $AB$ is $AB$ i	<i>B</i> is 1.5 s.
	(a) Find the value of $u$ .	
		(4)
	(b) Find the distance of P from B when $t = 2$ s.	(5)
		(5)
	(c) Find the speed of $P$ when $t = 2$ s.	(2)
		(2)
		TO THE PERSON NAMED OF THE
		The second section of the sect
-		
***************************************		
-		
***************************************		
*****		THINKS CONTROL OF CONT
		Manager and the State of the St
*************		
		Control of the Contro
***************************************		the same of the sa
		· · · · · · · · · · · · · · · · · · ·
-		
		MILE SECURITY AND SECURITY AND AND ASSESSED.
***		
-		
***************************************		
******************		

	Le
Question 2 continued	
·	
	A STATE OF THE STA
,	



iestion 2 continu	ed			
na minina na kalimuu hohiili maakanna yy menilikikan arrang An hei Halim			y haadanka kaan kii aangay ya maa kaan yo o maakan kaaliin kaan maaliin kaan maaliin midaalii kaan ka maaliin m	
And the second s		and the second s	The second section of the second section is a second section of the second section of the second section secti	
				A STATE OF THE STA
	THE STATE OF THE S		4 (2 mm)	Commence of the Commence of th
		anan a a a a a a a a a a a a a a a a a		
-				
		ALLAN CONTRACTOR OF THE STATE O	HARMING THE STATE OF THE STATE	anne de la companya del companya de la companya del companya de la
				CHEUTH-LIGHESTAN HARLING A AND AND AND AND AND AND AND AND AND A
		LIZANI ON ANTINI REPORTE ANTINI PROPERTY ANTIN		and the state of t
ACUIT THE STATE OF				
		All and the second seco	Alaman and the second	A STATE OF THE STA
				nament er der genannstatut. Hi propinsion er de service en en en
A CONTRACTOR OF		4.07		
				WIND ARCHITECTURE OF THE STATE



3.

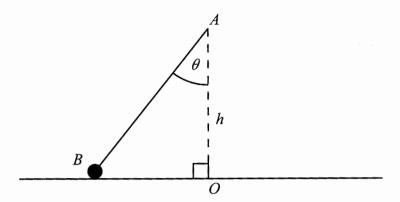


Figure 2

Figure 2 shows a particle B, of mass m, attached to one end of a light elastic string. The other end of the string is attached to a fixed point A, at a distance h vertically above a smooth horizontal table. The particle moves on the table in a horizontal circle with centre O, where O is vertically below A. The string makes a constant angle  $\theta$  with the downward vertical and B moves with constant angular speed  $\omega$  about OA.

(a) Show that 
$$\omega^2 \leqslant \frac{g}{h}$$
.

The elastic string has natural length h and modulus of elasticity 2 mg.

Given that  $\tan \theta = \frac{3}{4}$ ,

(b) find  $\omega$  in terms of g and h.

(5)
A



	Leave
Question 3 continued	Old II.



	Leave blank
Question 3 continued	
	A Committee of the Comm
·	
	THE STATE OF THE S
	Q3
(Total 13 marks)	



Leave blank

4.

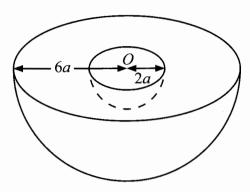


Figure 3

A uniform solid hemisphere, of radius 6a and centre O, has a solid hemisphere of radius 2a, and centre O, removed to form a bowl B as shown in Figure 3.

(a) Show that the centre of mass of B is  $\frac{30}{13}a$  from O. (5)

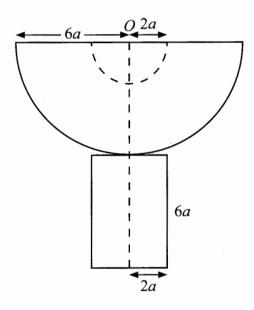


Figure 4

The bowl B is fixed to a plane face of a uniform solid cylinder made from the same material as B. The cylinder has radius 2a and height 6a and the combined solid S has an axis of symmetry which passes through O, as shown in Figure 4.

(b) Show that the centre of mass of S is 
$$\frac{201}{61}a$$
 from O. (4)

The plane surface of the cylindrical base of S is placed on a rough plane inclined at  $12^{\circ}$  to the horizontal. The plane is sufficiently rough to prevent slipping.

(c) Determine whether or not S will topple.

**(4)** 

	Leave
Question 4 continued	blank
Question 4 continued	
	100
	Name of Street
	2 Mary Mary Mary Mary Mary Mary Mary Mary
· · · · · · · · · · · · · · · · · · ·	All the same of th
	Action and the second
	1



	Leave
Question 4 continued	blank
Question 4 continued	

uestion 4 continued	b
	4
	WHAT I DO NOT THE TOTAL TO STATE OF THE TOTA



- 5. A particle P of mass m is attached to one end of a light inextensible string of length a. The other end of the string is attached to a fixed point O. The particle is released from rest with the string taut and OP horizontal.
  - (a) Find the tension in the string when *OP* makes an angle of 60° with the downward vertical.

**(6)** 

A particle Q of mass 3m is at rest at a distance a vertically below O. When P strikes Q the particles join together and the combined particle of mass 4m starts to move in a vertical circle with initial speed u.

(b) Show that 
$$u = \sqrt{\left(\frac{ga}{8}\right)}$$
. (3)

The combined particle comes to instantaneous rest at A.

- (c) Find
  - (i) the angle that the string makes with the downward vertical when the combined particle is at A,

(ii) the te	(ii) the tension in the string when the combined particle is at $A$ .			

estion 5 continued	
MILITER TO THE PARTY OF THE PAR	and the second s
	-
AND A CONTRACTOR AND PROPERTY OF THE PROPERTY	
	odeanarios.
	- Control Child
	*********
	***************************************
	плануми
	*******



estion 5 continued	
	with the same of t
	MARK SALAMARA
	WALLEST STREET, STREET
	A-Marketine with the shape programme and second control of the
	***************************************
	CONTRACTOR OF THE PROPERTY OF

	Leave blank
Question 5 continued	June
	Q5
(Total 15 marks)	



**6.** A particle P of mass 0.5 kg moves along the positive x-axis. It moves away from the origin O under the action of a single force directed away from O. When OP = x metres,

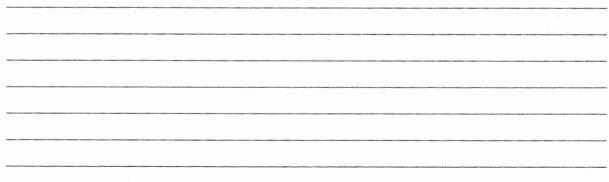
the magnitude of the force is  $\frac{3}{(x+1)^3}$  N and the speed of P is v m s<sup>-1</sup>.

Initially P is at rest at O.

(a) Show that  $v^2 = 6\left(1 - \frac{1}{(x+1)^2}\right)$ .

(b) Show that the speed of P never reaches  $\sqrt{6}$  m s<sup>-1</sup>. (1)

(c)	Find $x$ when $P$ has been moving for 2 seconds.	
		(7



	Leav blan
Question 6 continued	Vian
Zaconom o comunica	



nestion 6 continued	
	THE RESIDENCE OF THE PROPERTY
	ATT THE PARTY OF T
	AND
	MARKET CONTROL OF THE STATE OF
	Maria
	A STATE OF THE STA
	The state of the s
	_

Į:

estion 6 continued	
	Mary Control of the C
·	
	AND DESCRIPTION OF THE PARTY OF
	A CONTRACTOR OF THE PARTY OF TH
	The second of th
	FREE CONTRACTOR OF THE PROPERTY OF THE PROPERT



•
P. MINISTER STATE OF THE CONTROL OF