

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

Paper Reference(s)

6677/01

Edexcel GCE

Mechanics M1

Advanced/Advanced Subsidiary

Friday 12 January 2007 – Morning

Time: 1 hour 30 minutes

Examiner's use only

--	--	--

Team Leader's use only

--	--	--



ND003850623

[illegible]

Materials required for examination

Mathematical Formulae (Green)

Items included with question papers

Nil

Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and/or integration. Thus candidates may NOT use calculators such as the Texas Instruments TI 89, TI 92, Casio CFX 9970G, Hewlett Packard HP 48G.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.

Check that you have the correct question paper.

You must write your answer for each question in the space following the question.

Whenever a numerical value of g is required, take $g = 9.8 \text{ m s}^{-2}$.

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 7 questions in this question paper. The total mark for this paper is 75.

There are 16 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 must show sufficient working to make your methods clear to the Examiner. Answers without working may gain no credit.

This publication may be reproduced only in accordance with Edexcel Limited copyright policy.
©2007 Edexcel Limited.

Printer's Log. No.

N23560A

W850/R6677/57570 3/3/3/3/14,400



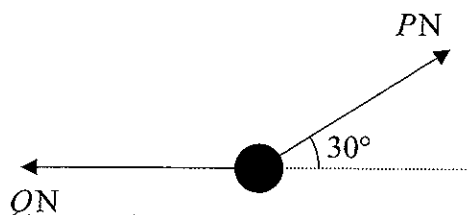
N 2 3 5 6 0 A 0 1 1 6

Turn over

edexcel 
advancing learning, changing lives

1.

Figure 1



A particle of weight 24 N is held in equilibrium by two light inextensible strings. One string is horizontal. The other string is inclined at an angle of 30° to the horizontal, as shown in Figure 1. The tension in the horizontal string is Q newtons and the tension in the other string is P newtons. Find

(a) the value of P ,

(3)

(b) the value of Q .

(3)



Leave
blank

Question 1 continued

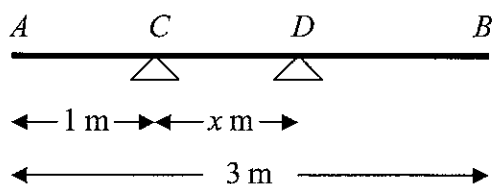
Q1

(Total 6 marks)



2.

Figure 2



A uniform plank AB has weight 120 N and length 3 m . The plank rests horizontally in equilibrium on two smooth supports C and D , where $AC = 1\text{ m}$ and $CD = x\text{ m}$, as shown in Figure 2. The reaction of the support on the plank at D has magnitude 80 N . Modelling the plank as a rod,

(a) show that $x = 0.75$

(3)

A rock is now placed at B and the plank is on the point of tilting about D . Modelling the rock as a particle, find

(b) the weight of the rock,

(4)

(c) the magnitude of the reaction of the support on the plank at D .

(2)

(d) State how you have used the model of the rock as a particle.

(1)



Q2

Question 2 continued

(Total 10 marks)



Leave
blank

3. A particle P of mass 2 kg is moving under the action of a constant force \mathbf{F} newtons. When $t = 0$, P has velocity $(3\mathbf{i} + 2\mathbf{j})\text{ m s}^{-1}$ and at time $t = 4\text{ s}$, P has velocity $(15\mathbf{i} - 4\mathbf{j})\text{ m s}^{-1}$. Find
- (a) the acceleration of P in terms of \mathbf{i} and \mathbf{j} , (2)
- (b) the magnitude of \mathbf{F} , (4)
- (c) the velocity of P at time $t = 6\text{ s}$. (3)



Leave
blank

Question 3 continued

Q3

(Total 9 marks)



- Immediately after the collision, a constant force of magnitude R newtons is applied to Q in the direction directly opposite to the direction of motion of Q . As a result Q is brought to rest in 1.5 s.

- (c) Find the value of R . (4)

Leave
blank

Question 4 continued

Q4

(Total 10 marks)



Leave
blank

5. A ball is projected vertically upwards with speed 21 m s^{-1} from a point A , which is 1.5 m above the ground. After projection, the ball moves freely under gravity until it reaches the ground. Modelling the ball as a particle, find
- (a) the greatest height above A reached by the ball, (3)
 - (b) the speed of the ball as it reaches the ground, (3)
 - (c) the time between the instant when the ball is projected from A and the instant when the ball reaches the ground. (4)



Leave
blank

Question 5 continued

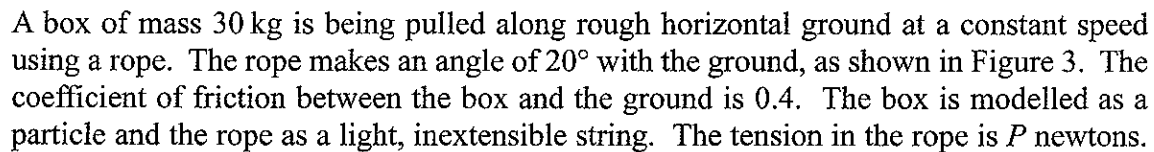
Q5

(Total 10 marks)



6.

Figure 3



- (a) Find the value of P .

(8)

The tension in the rope is now increased to 150 N.

- (b) Find the acceleration of the box.

(6)



Leave
blank

Question 6 continued

Q6

(Total 14 marks)



Leave
blank

7.

Figure 4

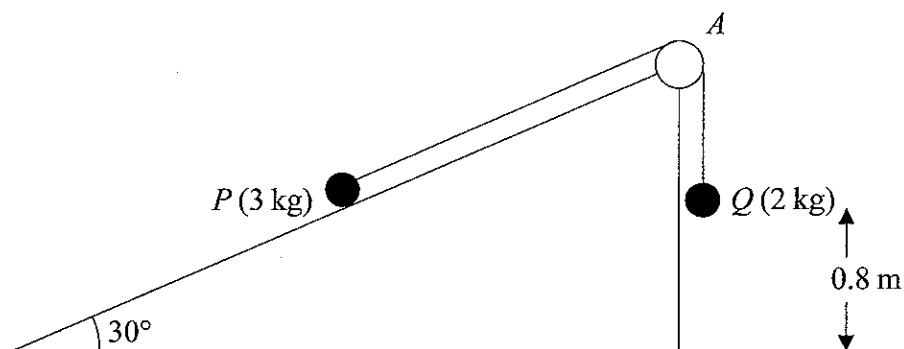


Figure 4 shows two particles P and Q , of mass 3 kg and 2 kg respectively, connected by a light inextensible string. Initially P is held at rest on a fixed smooth plane inclined at 30° to the horizontal. The string passes over a small smooth light pulley A fixed at the top of the plane. The part of the string from P to A is parallel to a line of greatest slope of the plane. The particle Q hangs freely below A . The system is released from rest with the string taut.

(a) Write down an equation of motion for P and an equation of motion for Q . (4)

(b) Hence show that the acceleration of Q is 0.98 m s^{-2} . (2)

(c) Find the tension in the string. (2)

(d) State where in your calculations you have used the information that the string is inextensible. (1)

On release, Q is at a height of 0.8 m above the ground. When Q reaches the ground, it is brought to rest immediately by the impact with the ground and does not rebound. The initial distance of P from A is such that in the subsequent motion P does not reach A . Find

(e) the speed of Q as it reaches the ground, (2)

(f) the time between the instant when Q reaches the ground and the instant when the string becomes taut again. (5)

Leave
blank

Question 7 continued



Leave
blank

1. The first step in the process of creating a new product is to identify a market need. This involves conducting market research to understand the preferences and behaviors of potential customers.

2. Once a market need is identified, the next step is to develop a concept. This involves brainstorming ideas and creating a rough sketch of the product.

3. The third step is to create a prototype. This involves building a small-scale model of the product to test its functionality and appearance.

4. After the prototype is created, the next step is to conduct a feasibility study. This involves evaluating the technical, financial, and market viability of the product.

5. Once the feasibility study is complete, the next step is to develop a business plan. This involves outlining the marketing, sales, and financial strategies for the product.

6. The final step in the process is to launch the product. This involves manufacturing the product, distributing it to retailers, and promoting it to the target market.

(Total 16 marks)

Q7

TOTAL FOR PAPER: 75 MARKS

END

