

Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	6	7	8	/	0	1	Signature	

Paper Reference(s)

6678/01

Edexcel GCE

Mechanics M2

Advanced/Advanced Subsidiary

Wednesday 21 May 2008 – Afternoon

Time: 1 hour 30 minutes

Examiner's use only

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Team Leader's use only

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[illegible]

Materials required for examination

Mathematical Formulae (Green)

Items included with question papers

Nil

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.

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

If you need more space to complete your answers to any question, use additional sheets.

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 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 must show sufficient working to make your methods clear to the examiner.

Answers without working may not gain full credit.

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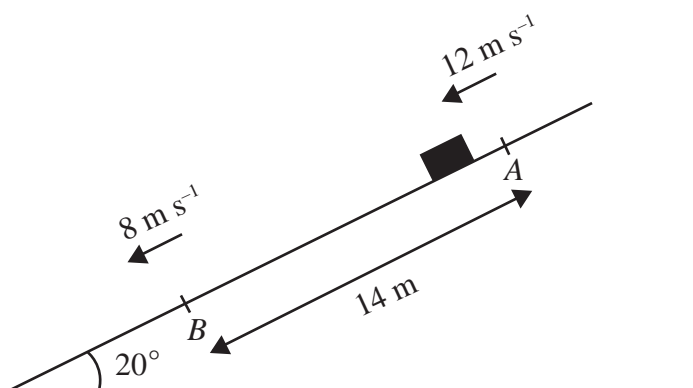
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1. A lorry of mass 2000 kg is moving down a straight road inclined at angle α to the horizontal, where $\sin \alpha = \frac{1}{25}$. The resistance to motion is modelled as a constant force of magnitude 1600 N. The lorry is moving at a constant speed of 14 m s⁻¹.

(6)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

3.



A package of mass 3.5 kg is sliding down a ramp. The package is modelled as a particle and the ramp as a rough plane inclined at an angle of 20° to the horizontal. The package slides down a line of greatest slope of the plane from a point A to a point B , where $AB = 14$ m. At A the package has speed 12 m s^{-1} and at B the package has speed 8 m s^{-1} , as shown in Figure 1. Find

- (a) the total energy lost by the package in travelling from A to B , (5)
- (b) the coefficient of friction between the package and the ramp. (5)

Leave
blank**Question 3 continued****Q3****(Total 10 marks)**

H 2 9 4 9 8 A 0 7 2 4

4. A particle P of mass 0.5 kg is moving under the action of a single force \mathbf{F} newtons. At time t seconds,

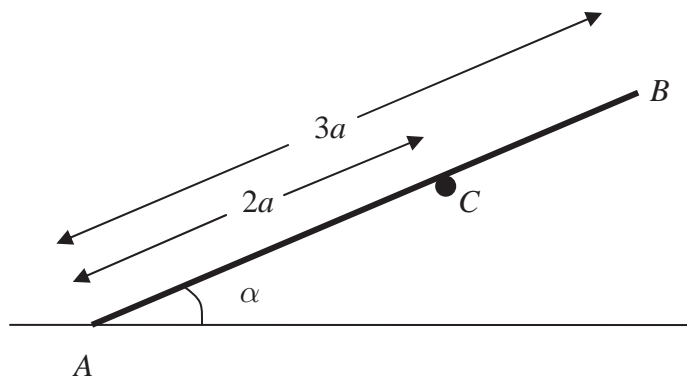
The velocity of P at time t seconds is \mathbf{v} m s⁻¹. When $t = 0$, $\mathbf{v} = \mathbf{i} - 4\mathbf{j}$.

- (6)

(6)

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5.



A plank rests in equilibrium against a fixed horizontal pole. The plank is modelled as a uniform rod AB and the pole as a smooth horizontal peg perpendicular to the vertical plane containing AB . The rod has length $3a$ and weight W and rests on the peg at C , where $AC = 2a$. The end A of the rod rests on rough horizontal ground and AB makes an angle α with the ground, as shown in Figure 2.

- Given that the rod is in limiting equilibrium and that $\cos \alpha = \frac{2}{3}$,

- (b) find the coefficient of friction between the rod and the ground. (5)

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Question 5 continued



6.



Figure 3 shows a rectangular lamina $OABC$. The coordinates of O , A , B and C are $(0, 0)$, $(8, 0)$, $(8, 5)$ and $(0, 5)$ respectively. Particles of mass km , $5m$ and $3m$ are attached to the lamina at A , B and C respectively.

(a) Show that $k = 7$.

The lamina $OABC$ is uniform and has mass $12m$.

(b) Find the coordinates of the centre of mass of the combined system consisting of the three particles and the lamina.

The combined system is freely suspended from O and hangs at rest.

(c) Find the angle between OC and the horizontal.

(3)

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Question 6 continued



7.



(c) Find the speed of the ball at X . (5)

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blank**Question 7 continued****Q7****(Total 14 marks)****TOTAL FOR PAPER: 75 MARKS****END**