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Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Mechanics M1

Advanced/Advanced Subsidiary

Wednesday 6 June 2018 – Morning

Time: 1 hour 30 minutes

Paper Reference

WME01/01**You must have:**

Mathematical Formulae and Statistical Tables (Blue)

Total Marks

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

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B). Coloured pencils and highlighter pens must not be used.
- **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.
- When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information

- 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.

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1. Particle P has mass $3m$ and particle Q has mass m . The particles are moving towards each other in opposite directions along the same straight line on a smooth horizontal plane. The particles collide directly. Immediately before the collision the speed of P is u and the speed of Q is $3u$. In the collision, the magnitude of the impulse exerted by Q on P is $5mu$.

(i) Find the speed of P immediately after the collision.

(ii) Find the speed of Q immediately after the collision.

(6)

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Question 2 continued

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Question 2 continued

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Q2

3. A cyclist starts from rest at the point O on a straight horizontal road. The cyclist moves along the road with constant acceleration 2 ms^{-2} for 4 seconds and then continues to move along the road at constant speed. At the instant when the cyclist stops accelerating, a motorcyclist starts from rest at the point O and moves along the road with constant acceleration 4 ms^{-2} in the same direction as the cyclist. The motorcyclist has been moving for T seconds when she overtakes the cyclist.

- (a) Sketch, on the same axes, a speed-time graph for the motion of the cyclist and a speed-time graph for the motion of the motorcyclist, to the time when the motorcyclist overtakes the cyclist.

(b) Find, giving your answer to 1 decimal place, the value of T .

Question 3 continued

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Question 3 continued

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(c) Find the speed of P as it passes through O .

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Q4

(Total 13 marks)



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Question 5 continued

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6. A car pulls a trailer along a straight horizontal road using a light inextensible towbar. The mass of the car is M kg, the mass of the trailer is 600 kg and the towbar is horizontal and parallel to the direction of motion. There is a resistance to motion of magnitude 200 N acting on the car and a resistance to motion of magnitude 100 N acting on the trailer. The driver of the car spots a hazard ahead. Instantly he reduces the force produced by the engine of the car to zero and applies the brakes of the car. The brakes produce a braking force on the car of magnitude 6500 N and the car and the trailer have a constant deceleration of magnitude 4 m s^{-2} .

Given that the resistances to motion on the car and trailer are unchanged and that the car comes to rest after travelling 40.5 m from the point where the brakes were applied, find

- (a) the thrust in the towbar while the car is braking, (3)
- (b) the value of M , (3)
- (c) the time it takes for the car to stop after the brakes are applied. (3)

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Question 6 continued

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- (a) Find the tension in AB . (4)
- (b) Find the tension in BC . (3)
- (c) Find the value of M . (5)

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Question 7 continued

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Q7

(Total 12 marks)

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