Constant Acceleration 2D

Question Paper 7

Level	A Level
Subject	Maths
Exam Board	AQA
Module	Mechanics 1
Topic	Motion
Sub Topic	Constant Acceleration 2D
Booklet	Question Paper - 7

Time Allowed: **45 minutes**

Score: **/36**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

Q1. A particle moves in a horizontal plane. The unit vectors **i** and **j** are perpendicular and lie in the horizontal plane.

Initially the particle is at the origin and has velocity (5**i** – 2**j**) m s^{-1}. It moves with constant acceleration. At time t = 10 it has position vector (40**i** – 15**j**) metres.

(a) Show that the velocity of the particle is (3**i** – **j**) m s^{-1} when t = 10.

(4)

(b) Find the acceleration of the particle.

(3)

(c) The mass of the particle is 15 kg. Find the magnitude of the resultant force acting on the particle.

(4)

(Total 11 marks)

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A particle of mass 4 kg moves on a smooth horizontal plane. It is initially at rest at the origin. A force **F** = (8**i** – 12**j**) N acts on the particle for 20 seconds. The unit vectors **i** and **j** are perpendicular and lie in the horizontal plane.

(a) (i) Find the acceleration of the particle.

(2)

(ii) Find the velocity of the particle at the end of the 20 second period.

(2)

(iii) Find the position of the particle at the end of the 20 second period.

(3)

(b) At the end of the 20 second period, the force **F** is removed. Find the distance of the particle from the origin after the particle has been in motion for a total of 45 seconds.

(5)

(Total 12 marks)

Q3. A model aeroplane moves in a horizontal plane with a constant acceleration. Initially the aeroplane is at the origin and has velocity (35**i** + 45**j**) m s^{-1}. After accelerating for 8 seconds, the velocity of the aeroplane is (19**i** + 13**j**) m s^{-1}. The unit vectors **i** and **j** are perpendicular and lie in the horizontal plane.

(a) Show that the acceleration of the aeroplane is (- 2**i** - 4**j**) m s^{-2}.

(3)

(b) Find an expression for the position vector of the aeroplane at time *t* seconds.

(3)

(c) Find the time when the position vector of the aeroplane is (300**i** + 225**j**) m.

(7)

(Total 13 marks)