

Topic Test

Summer 2022

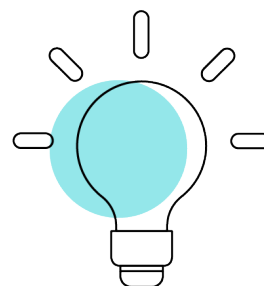
Pearson Edexcel GCE Mathematics (9MA0)

Paper 3 – Mechanics

Topic 2: Kinematics – Variable Acceleration

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Question T2_Q1

At time t seconds, where $t \geq 0$, a particle, P , moves so that its velocity v ms^{-1} is given by

$$\mathbf{v} = 6t\mathbf{i} - 5t^{\frac{3}{2}}\mathbf{j}$$

(a) Find the acceleration of P when $t = 4$

(3)

(3)

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Question T2_Q2

3. (i) At time t seconds, where $t \geq 0$, a particle P moves so that its acceleration $\mathbf{a} \text{ m s}^{-2}$ is given by

$$\mathbf{a} = (1 - 4t)\mathbf{i} + (3 - t^2)\mathbf{j}$$

At the instant when $t = 0$, the velocity of P is $36\mathbf{i} \text{ m s}^{-1}$

- (a) Find the velocity of P when $t = 4$ (3)

- (b) Find the value of t at the instant when P is moving in a direction perpendicular to $\mathbf{i}$
- (3)**

- (ii) At time t seconds, where $t \geq 0$, a particle Q moves so that its position vector $\mathbf{r}$ metres, relative to a fixed origin O , is given by

$$\mathbf{r} = (t^2 - t)\mathbf{i} + 3t\mathbf{j}$$

Find the value of t at the instant when the speed of Q is 5 m s^{-1}

Question T2_Q3

- 5.** At time t seconds, a particle P has velocity $\mathbf{v} \text{ m s}^{-1}$, where

$$\mathbf{v} = 3t^{\frac{1}{2}} \mathbf{i} - 2t \mathbf{j} \quad t > 0$$

- (a) Find the acceleration of P at time t seconds, where $t > 0$ (2)
- (b) Find the value of t at the instant when P is moving in the direction of $\mathbf{i} - \mathbf{j}$ (3)

At time t seconds, where $t > 0$, the position vector of P , relative to a fixed origin O , is $\mathbf{r}$ metres.

When $t = 1$, $\mathbf{r} = -\mathbf{j}$

- (c) Find an expression for $\mathbf{r}$ in terms of t . (3)
- (d) Find the exact distance of P from O at the instant when P is moving with speed 10 m s^{-1} (6)

