Variable Acceleration - Edexcel Past Exam Questions

1. A particle P moves on the x-axis. At time t seconds, its acceleration is $(5 - 2t)$ m s^{-2}, measured in the direction of x increasing. When $t = 0$, its velocity is 6 m s^{-1} measured in the direction of x increasing. Find the time when P is instantaneously at rest in the subsequent motion.

(6)
June 06 Q1

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2. A particle P moves on the x-axis. At time t seconds the velocity of P is v m s^{-1} in the direction of x increasing, where v is given by

$$v = \begin{cases} 8t - \frac{3}{2}t^2, & 0 \le t \le 4 \\ 16 - 2t, & t > 4. \end{cases}$$

When $t = 0$, P is at the origin O.

Find

(a) the greatest speed of P in the interval $0 \le t \le 4$, **(4)**

(b) the distance of P from O when $t = 4$, **(3)**

(c) the time at which P is instantaneously at rest for $t > 4$, **(1)**

(d) the total distance travelled by P in the first 10 s of its motion. **(8)**

June 07 Q8

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3. A particle P moves along the x-axis in a straight line so that, at time t seconds, the velocity of P is v m s^{-1}, where

$$v = \begin{cases} 10t - 2t^2, & 0 \le t \le 6, \\ \dfrac{-432}{t^2}, & t > 6. \end{cases}$$

At $t = 0$, P is at the origin O. Find the displacement of P from O when

(a) $t = 6$, **(3)**

(b) $t = 10$. **(5)**

Jan 09 Q4

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4. At time $t = 0$ a particle P leaves the origin O and moves along the x-axis. At time t seconds the velocity of P is v m s^{-1}, where

$$v = 8t - t^2.$$

(*a*) Find the maximum value of v. **(4)**

(*b*) Find the time taken for P to return to O. **(5)**

June 09 Q2

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5. A particle P moves along the x-axis. At time t seconds the velocity of P is v m s^{-1} in the positive x-direction, where $v = 3t^2 - 4t + 3$. When $t = 0$, P is at the origin O. Find the distance of P from O when P is moving with minimum velocity.

(8)

Jan 10 Q1

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6. A particle P moves on the x-axis. The acceleration of P at time t seconds, $t \geq 0$, is $(3t + 5)$ m s^{-2} in the positive x-direction. When $t = 0$, the velocity of P is 2 m s^{-1} in the positive x-direction. When $t = T$, the velocity of P is 6 m s^{-1} in the positive x-direction.

Find the value of T. **(6)**

June 10 Q1

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7. A particle moves along the x-axis. At time $t = 0$ the particle passes through the origin with speed 8 m s^{-1} in the positive x-direction. The acceleration of the particle at time t seconds, $t \geq 0$, is $(4t^3 - 12t)$ m s^{-2} in the positive x-direction.

Find

(*a*) the velocity of the particle at time t seconds, **(3)**

(*b*) the displacement of the particle from the origin at time t seconds, **(2)**

(*c*) the values of t at which the particle is instantaneously at rest. **(3)**

Jan 11 Q3

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8. A particle P moves on the x-axis. The acceleration of P at time t seconds is $(t-4)$ m s^{-2} in the positive x-direction. The velocity of P at time t seconds is v m s^{-1}. When $t = 0$, $v = 6$.

Find

(a) v in terms of t,   **(4)**

(b) the values of t when P is instantaneously at rest,   **(3)**

(c) the distance between the two points at which P is instantaneously at rest.   **(4)**

June 11 Q6