

A Level H2 Physics

Tutorial 2: Kinematics

Syllabus :

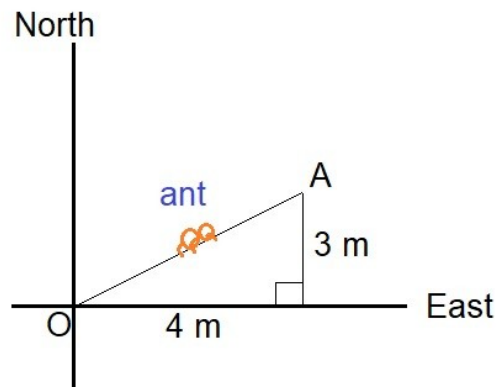
(a) show an understanding of and use the terms distance, displacement, speed, velocity and acceleration

1.

(a) State the meanings of:

- (i) distance and displacement
- (ii) speed and velocity
- (iii) acceleration

(b)



(i) Find the distance OA.

(ii) State the displacement of the ant when it crawled from O to A.

(c) It takes 50 s for the ant to crawl from O to A.

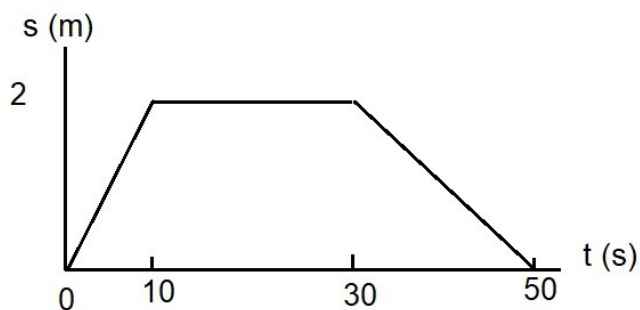
- (i) Find the speed of the ant.
- (ii) Find its velocity.

(d) The ant starts from O again. It starts from rest and crawls faster and faster towards A, reaching 0.10 m/s after 20 s. Find its acceleration.

(b) use graphical methods to represent distance, displacement, speed, velocity and acceleration

(c) identify and use the physical quantities from the gradients of displacement-time graphs and areas under and gradients of velocity-time graphs, including cases of non-uniform acceleration

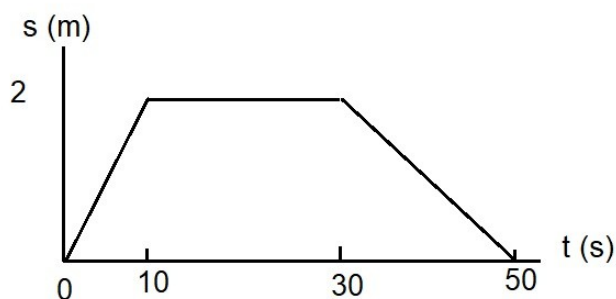
2.



A baby crawls from point O in a straight line. Her displacement is given by the graph above.

- (a) Find her speed and velocity at $t = 5 \text{ s}$, 20 s and 40 s .
- (b) What is her distance and displacement crawled from $t = 0$ to 50 s .

3.



A girl runs along a straight foot path. Her velocity is given by the graph above.

- (i) Find her acceleration at $t = 5 \text{ s}$ and at $t = 40 \text{ s}$.
- (ii) Find her distance moved between 0 to 10 s.

(iii) Find her velocity at $t = 40$ s.

(d) derive, from the definitions of velocity and acceleration, equations which represent uniformly accelerated motion in a straight line

4. Let

s be the displacement of an object from point O,
 t be the time taken,
 u its velocity at time $t = 0$,
 v its velocity at time t , and
 a its acceleration.

(a) State the definition of acceleration, and write down the equation relating a to u , v and t .

(b) For uniform acceleration:

(i) Write down an expression to relate average velocity to s and t .

(ii) Show that the displacement is given by $s = ut + \frac{1}{2}at^2$.

(iii) Obtain an expression for $(v - u)$ from (a), and an expression for $(v + u)$ from (i).
Then show that $v^2 = u^2 + 2as$.

(e) solve problems using equations which represent uniformly accelerated motion in a straight line, including the motion of bodies falling in a uniform gravitational field without air resistance

(f) describe qualitatively the motion of bodies falling in a uniform gravitational field with air resistance

5. (a) A stone is dropped from height 1 m. How long does it take to hit the ground. Assume acceleration due to gravity is 9.8 m/s^2 .

(b) How would it be different if there is air resistance?

(g) describe and explain motion due to a uniform velocity in one direction and a uniform acceleration in a perpendicular direction

6. On an oily ground, a ball moves with almost no friction, at a constant speed. A force of constant magnitude pushes at the ball, always at right angle to its velocity.

- (i) Describe the shape of the ball's motion.
- (ii) Suggest a simple way to produce such a force.

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