

Unit 4

Questions 19 to 22

A particle of mass $m = \frac{1}{2}$ moves along a chosen x -axis so that its position at time t is given by

$$x = 9 + 6t - t^3.$$

All variables are measured in the appropriate SI units.

- 6 ~~36~~ ²
- 19 Choose the option which gives the velocity of the particle at the instant $t = 2$. C
20 Choose the option which gives the speed of the particle at the instant $t = 2$. F
21 Choose the option which gives the acceleration of the particle at the instant $t = 2$. B
22 Choose the option which gives the x -component of the total force acting on the particle at the instant $t = 2$. C

Options for Questions 19 to 22

- | | | | |
|-------|-------|------|------|
| A -24 | B -12 | C -6 | D 0 |
| E 3 | F 6 | G 12 | H 24 |

Questions 23 and 24

A particle of mass m moves along a vertical straight line under the action of the force of gravity and the force of air resistance. The air resistance is proportional to the speed of the particle, with a constant of proportionality k . The velocity v of the particle is measured relative to an x -axis which points vertically downwards. The magnitude of the acceleration due to gravity is denoted by g .

- 23 Select the option which is the equation of motion of the particle when it is moving upwards. B
24 Select the option which is the equation of motion of the particle when it is moving downwards. B

Options for Questions 23 and 24

- A $m \frac{dv}{dt} = mg + kv$ B $m \frac{dv}{dt} = mg - kv$
C $m \frac{dv}{dt} = -mg + kv$ D $m \frac{dv}{dt} = -mg - kv$