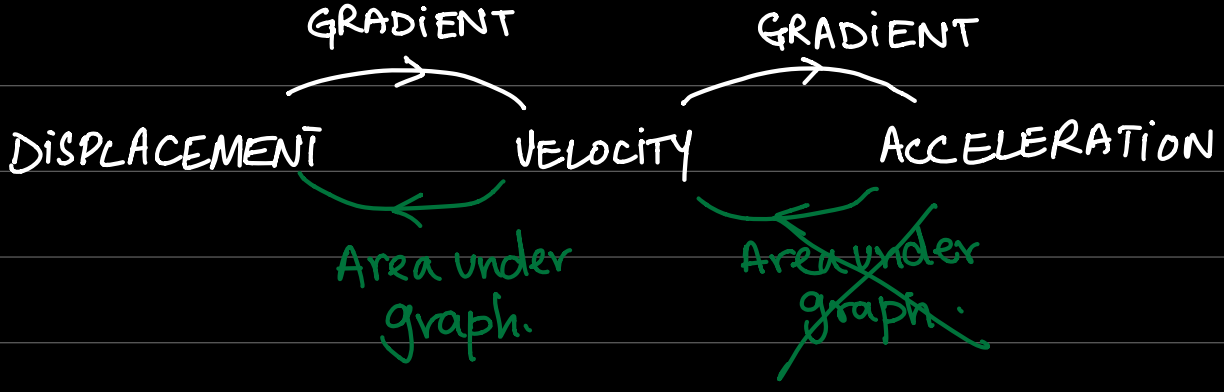
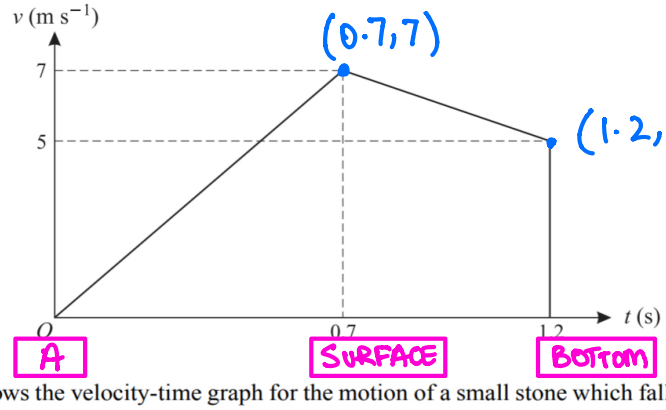


EXAM TIP YOU HAVE TO DRAW REAL-TIME DIAGRAM OF EXPERIMENT AND RELATE KEY MOMENTS ON GRAPH.

7



The diagram shows the velocity-time graph for the motion of a small stone which falls vertically from rest at a point A above the surface of liquid in a container. The downward velocity of the stone t s after leaving A is v m s^{-1}. The stone hits the surface of the liquid with velocity 7 m s^{-1} when $t = 0.7$. It reaches the bottom of the container with velocity 5 m s^{-1} when $t = 1.2$.

(i) Find DISTANCE (area under graph)

(a) the height of A above the surface of the liquid,

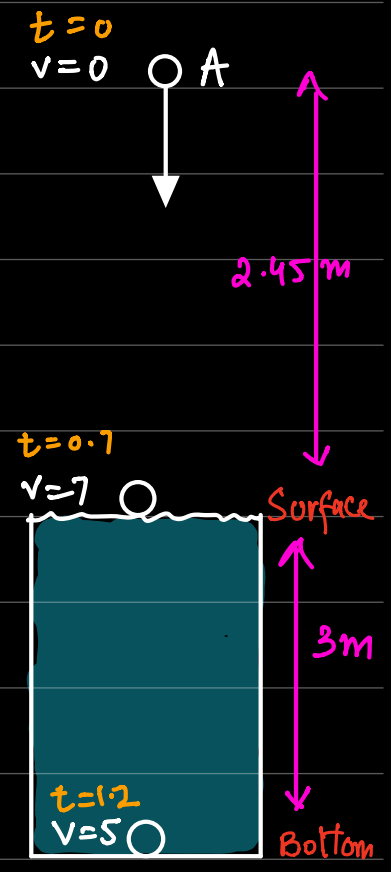
(b) the depth of liquid in the container.

DISTANCE (area under graph) [3]

(ii) Find the deceleration of the stone while it is moving in the liquid. [2]

Acceleration (gradient)

(iii) Given that the resistance to motion of the stone while it is moving in the liquid has magnitude value 0.7 N, find the mass of the stone. [3]



(i) (a) Area $= \frac{1}{2}(0.7)(7) = 2.45$ m.

(b) Depth = Area under graph (Surface $\longrightarrow$ Bottom)

Area of trapezium $= \frac{1}{2}(0.5)(7+5) = 3m$

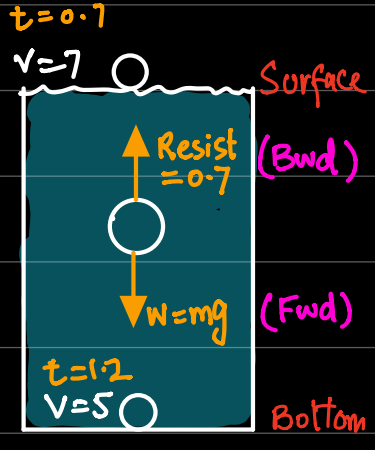
(ii) $(0.7, 7)$ $(1.2, 5)$

deceleration $\approx$ acc = gradient $= \frac{5-7}{1.2-0.7} = \frac{-2}{0.5}$

acceleration $= -4$

deceleration $= 4$

ACC WITH FORCES



Fwd - Bwd = ma

$mg - 0.7 = m(-4)$

$m(10) - 0.7 = -4m$

$10m + 4m = 0.7$

$14m = 0.7$

$m = 0.05$