2 A plane is flying with a velocity v of 220 m s^{-1} at an angle of 30° with respect to the horizontal, as shown in Fig. 2.1.

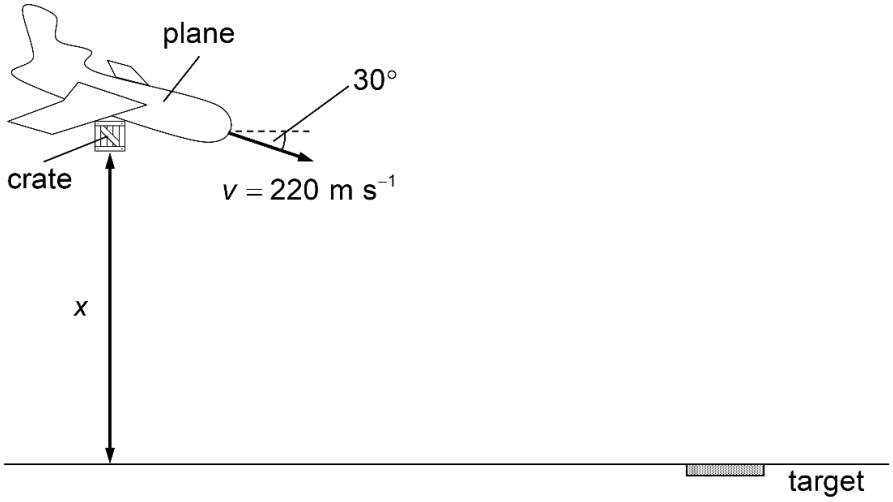

Fig. 2.1

At an altitude of x, a crate is released from the plane. The crate hits the target on the ground after 16.8 s. Assume air resistance is negligible.

(a) (i) Calculate the value of x.

x = ... m [2]

(ii) Determine the speed attained by the crate just before it hits the target.

speed = ... m s^{-1} [3]

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(iii) On Fig. 2.2, sketch the variation with time t of the horizontal velocity v_x of the crate. Label this graph S.

Fig. 2.2

[1]

(b) If air resistance is not negligible, on Fig. 2.2, sketch the variation with t of v_x. Label this graph R. [1]

[Total: 7]