1 A stone of mass 130 g is thrown horizontally from the top of a cliff of height 32 m, as illustrated in Fig. 1.1.

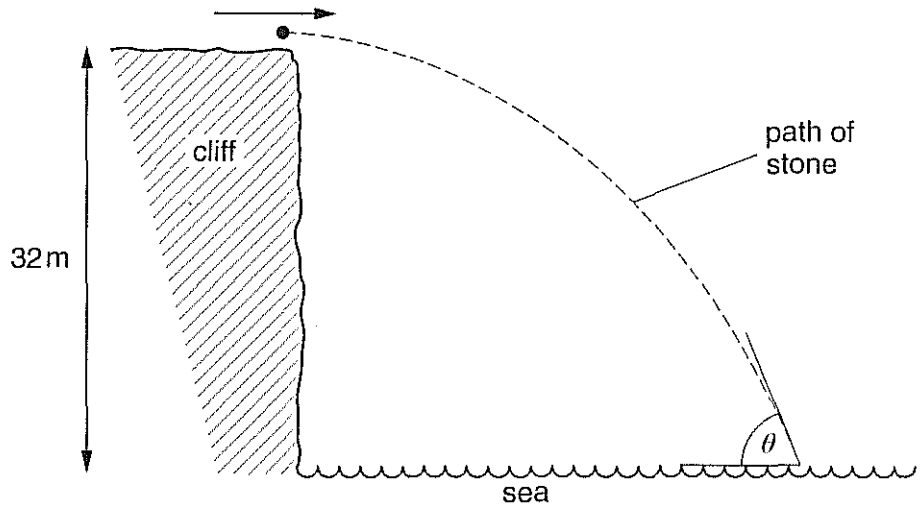

Fig. 1.1

Air resistance is negligible. The stone enters the sea with a speed of 34 m s^{-1}.

(a) Determine, for the stone as it hits the sea,

(i) the vertical component of the velocity of the stone,

vertical component of velocity = ... m s^{-1} [2]

(ii) the angle θ to the horizontal of the stone's path.

θ = ... ° [2]

(b) On hitting the sea, the speed of the stone is reduced from $34\,m\,s^{-1}$ to $2.0\,m\,s^{-1}$ in a time of 0.95 s.
Use momentum considerations to determine the average force on the stone during this time.

force = ... N [2]

(c) Use energy considerations to suggest why, if the stone causes a large splash on hitting the sea, it will be slowed down in a shorter distance than when no splash is produced.

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.....[2]