**2** An object of mass 0.25 kg is launched with an initial speed, $u$, at an angle of $40^{\circ}$ from the top of a cliff 100 m tall, as shown in Fig. 2.1.

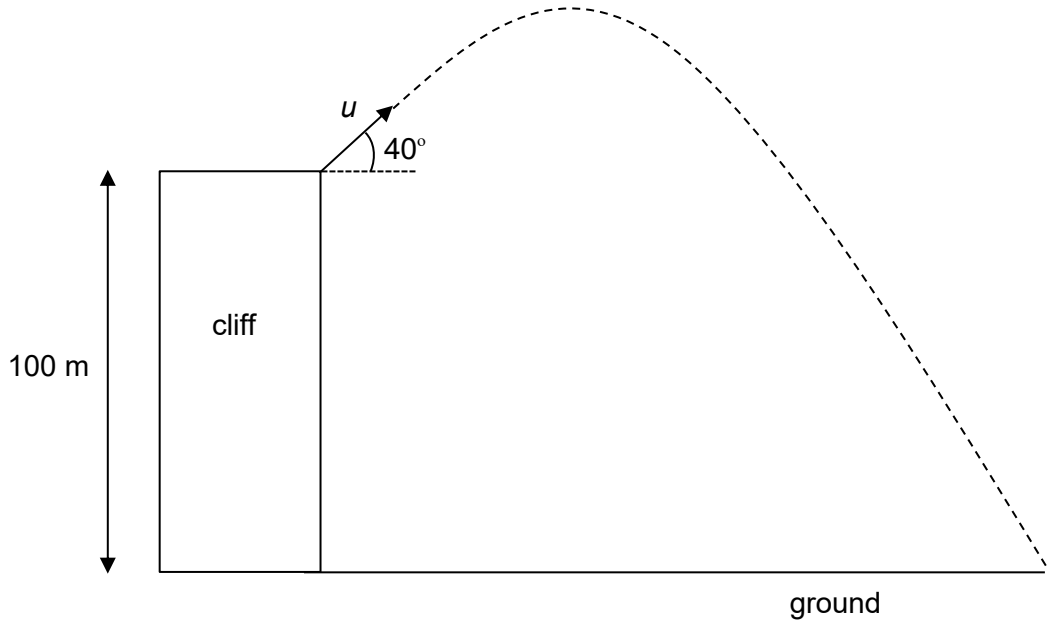


**Fig 2.1**

The minimum kinetic energy of the object during the trajectory is 12.5 J. Assume that air resistance is negligible.

**(a)** Explain why kinetic energy is minimum at the top of the trajectory.

……

…… [1]

**(b)** Show that $u$ is 13 m $s^{-1}$.

[2]

**(c)** The object was in the air for a duration of time $t$ before hitting the ground.

**(i)** Determine time $t$.

$t$ = ……..… s [2]

**(ii)** Calculate the horizontal distance travelled by the object before hitting the ground.

horizontal distance = …… m [1]

**(iii)** Determine the magnitude and direction of the velocity of the object just before it hits the ground.

magnitude of velocity = ……..… $m\ s^{-1}$

direction: ……..… [3]