2 **(a)** State the principle of conservation of momentum.

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.....

.....[1]

(b) Fig. 2.1 shows a metal bullet of mass 2.0 g fired horizontally into a block of wood of mass 600 g. The block is suspended from strings so that it is free to move in the vertical plane. The bullet hits and becomes embedded in the block. The block and bullet rise together through a vertical distance of 8.6 cm.

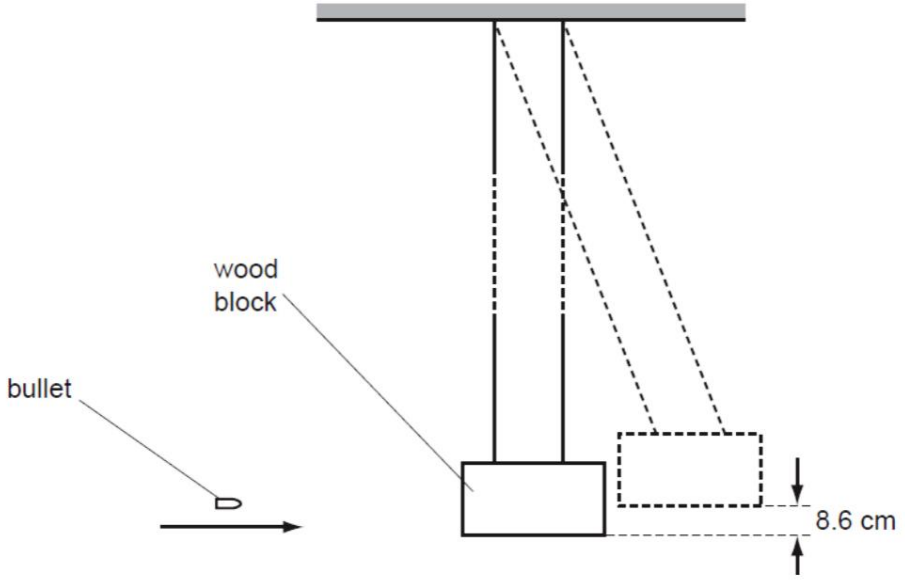

Fig. 2.1

(i) Show that the speed of the block and bullet as they just move off together is 1.3 m s^{-1}.

[2]

(ii) Using **(a)** and **(b)(i)**, determine the speed of the bullet before the impact with the block.

speed = ... m s^{-1} [2]

(iii) A rubber bullet of the same mass hits the block with the same speed calculated in **(ii)** and rebounds in the opposite direction. State and explain whether the block will reach a maximum height of greater or less than 8.6 cm.

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.....[2]

[Total : 7]