Condition on Height of Release (including rotational K.E.)

Solution:

The correct answer is c.)

From Question 3, we know that the minimum K.E. required to complete the loop as the enters it is $2.5mg(R-r)$.

Thus, we have:

$$\left(\frac{1}{2}\right)\cancel{m}v_b^2 \geq 2.5\cancel{m}g(R-r) \Rightarrow v_b^2 \geq 5g(R-r)$$

$$\dots (1)$$

Condition on Height of Release (including rotational K.E.)

Also, from Question 5, we know that:

$$\left(\frac{7}{10}\right)v_b^2 = gh$$

$$\dots (2)$$

Substituting (1) into (2), we get:

$$\cancel{g}h \geq \left(\frac{7}{10}\right)\left[5\cancel{g}(R-r)\right]$$

$$\Rightarrow h \geq 3.5(R-r)$$