Q) A small block of mass \( m = 5 \) kg can slide along the frictionless loop-the-loop, with loop radius \( R = 10 \) m.

![Diagram of a loop-the-loop](image)

The block is released from rest at point \( P \), at height \( h = 5.0R \) above the bottom of the loop. How much work does the gravitational force do on the block as the block travels from point \( P \) to

(a) Point \( Q \)?

\[
\text{Work done} = -\Delta U = -(U_f - U_i) = U_i - U_f
\]

\( U_i = mgh = 5mgR \)

\( U_f = mgR \)

\[
W = 5mgR - mgR = 4mgR = 4 \times 5 \times 9.8 \times 10 = 1960J
\]

(b) The top of the loop?

\( U_i = 5mgR \)

\( U_f = 2mgR \)

\[
W = U_i - U_f = 3mgR = 1470J
\]