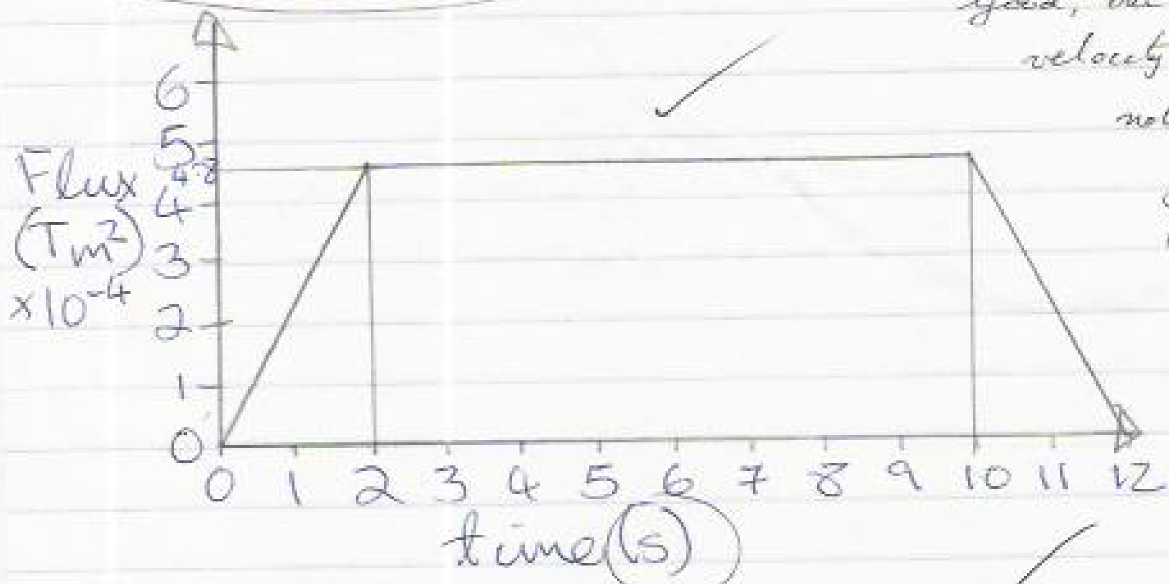
whilly inside the field, stays constant while the loop passes through the field, then starts to decrease steadily to zero as the loop reaches the edge of the field, reaching zero when the loop is wholly outside it.

The flux takes two seconds to reach a maximum through the coil, $\Phi_{max} = BA = 0.3 \times 0.04^2 = 4.8 \times 10^{-4}\ Tm^2$, takes eight seconds for GH to reach the edge of the field, and a further two seconds to exit the field, a total of twelve seconds.

Good, but take care: the velocity is given as 2 ms⁻¹ not 2 cms⁻¹. Hence you should cover the time from 0 to 120 ms.



$\frac{7}{9}$

b) Rate of change of flux is constant between $t=0$ and $t=2$, zero between $t=2$ and $t=10$, and constant again between $t=10$ and $t=12$. Between $t=0$ and $t=2$, $d\Phi/dt = 4.8E{-4}\ Tm^2/2s = 2.4E{-4}\ Tm^2/s$. Between $t=10$ and $t=12$, $d\Phi/dt = -4.8E{-4}\ Tm^2/2s = -2.4\ Tm^2/s$ (since Φ is decreasing).

Hence rate of change of flux as the loop enters the region ABCD $= 2.4E{-4}\ Tm^2/s$, rate of change of flux as the loop leaves ABCD $= -2.4\ Tm^2/s$.

$\frac{6}{6}$ *Correct for time in seconds, error carried forward without penalty.*

Correct answer $|d\Phi/dt| = 2.4 \times 10^{-2}\ Tm^2s^{-1}$