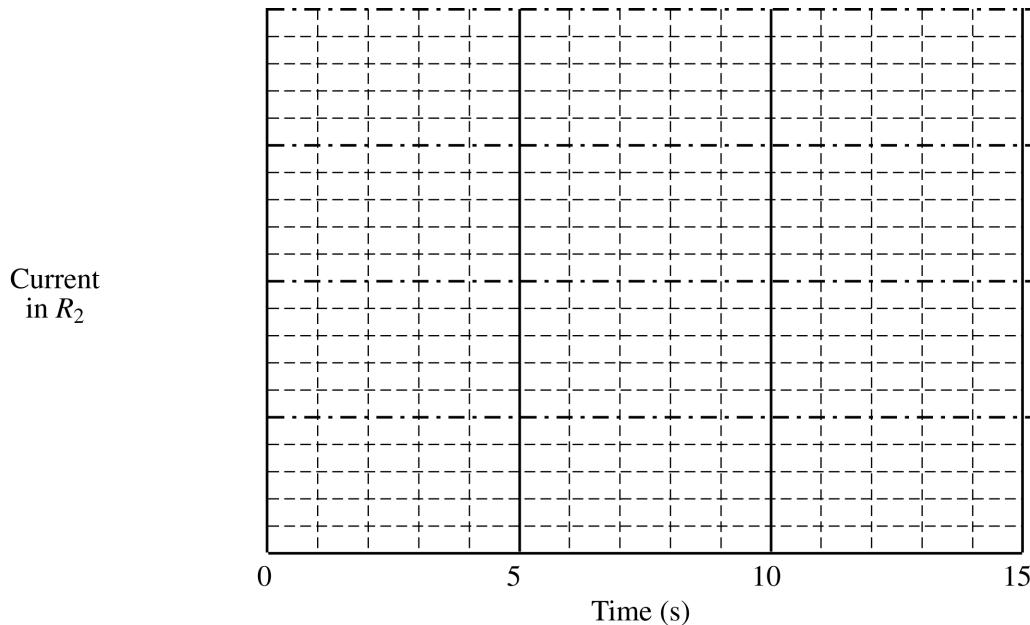


**2004 AP[®] PHYSICS C: ELECTRICITY AND MAGNETISM
FREE-RESPONSE QUESTIONS**

- (e) On the axes below, graph the current in R_2 as a function of time from 0 to 15 s. Label the vertical axis with appropriate values.



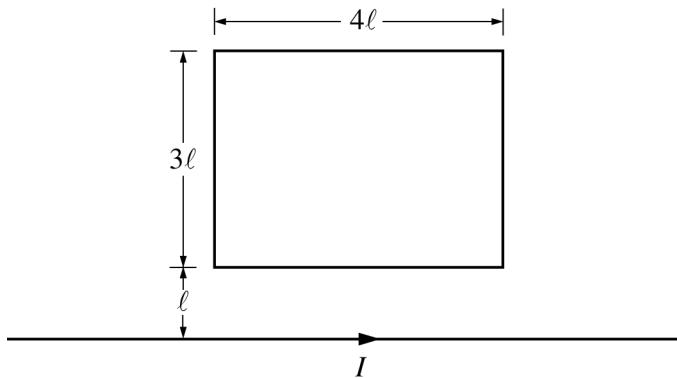
Resistor R_2 is removed and replaced with another resistor of lesser resistance. Switch S remains closed for a long time.

- (f) Indicate below whether the energy stored in the capacitor is greater than, less than, or the same as it was with resistor R_2 in the circuit.

Greater than Less than The same as

Explain your reasoning.

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E&M. 3.

A rectangular loop of dimensions 3ℓ and 4ℓ lies in the plane of the page as shown above. A long straight wire also in the plane of the page carries a current I .

- (a) Calculate the magnetic flux through the rectangular loop in terms of I , ℓ , and fundamental constants.

Starting at time $t = 0$, the current in the long straight wire is given as a function of time t by

$$I(t) = I_0 e^{-kt}, \text{ where } I_0 \text{ and } k \text{ are constants.}$$

- (b) The current induced in the loop is in which direction?

Clockwise Counterclockwise

Justify your answer.

The loop has a resistance R . Calculate each of the following in terms of R , I_0 , k , ℓ , and fundamental constants.

- (c) The current in the loop as a function of time t

- (d) The total energy dissipated in the loop from $t = 0$ to $t = \infty$

END OF SECTION II, ELECTRICITY AND MAGNETISM