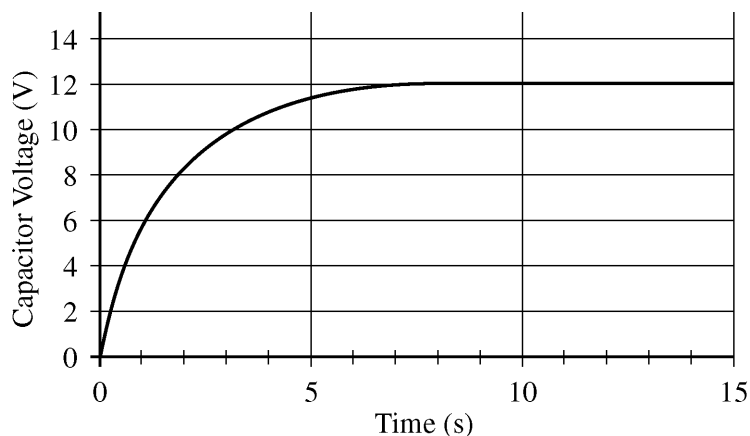
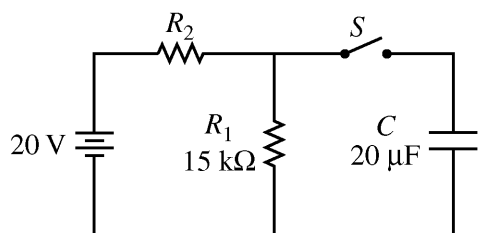


**2004 AP[®] PHYSICS C: ELECTRICITY AND MAGNETISM
FREE-RESPONSE QUESTIONS**



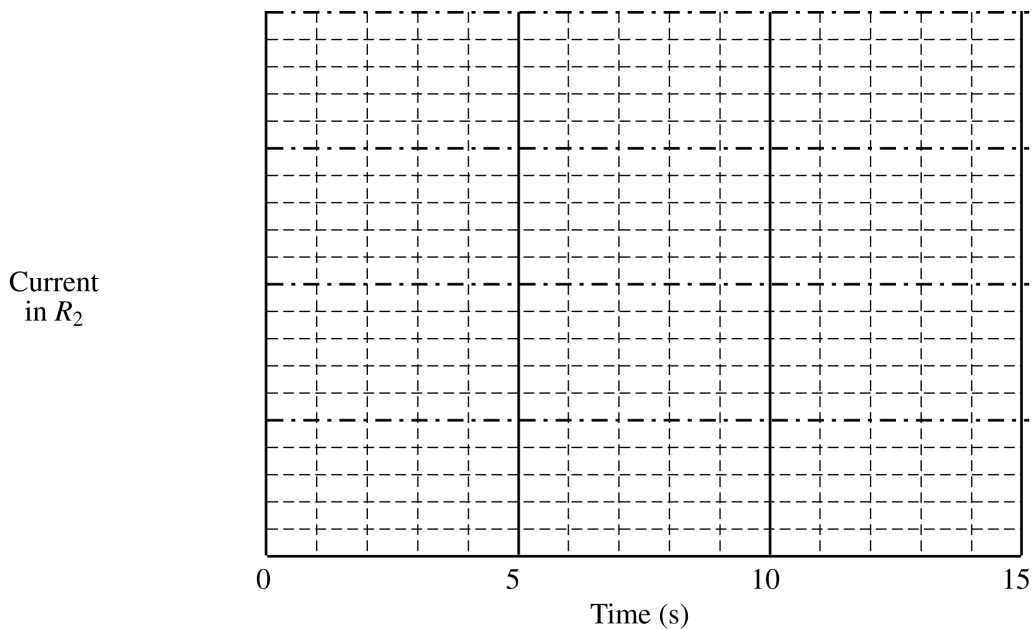
E&M. 2.

In the circuit shown above left, the switch S is initially in the open position and the capacitor C is initially uncharged. A voltage probe and a computer (not shown) are used to measure the potential difference across the capacitor as a function of time after the switch is closed. The graph produced by the computer is shown above right. The battery has an emf of 20 V and negligible internal resistance. Resistor R_1 has a resistance of $15\text{ k}\Omega$ and the capacitor C has a capacitance of $20\text{ }\mu\text{F}$.

- (a) Determine the voltage across resistor R_2 immediately after the switch is closed.
- (b) Determine the voltage across resistor R_2 a long time after the switch is closed.
- (c) Calculate the value of the resistor R_2 .
- (d) Calculate the energy stored in the capacitor a long time after the switch is closed.

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- (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.