**47 Inductors in series.** Two inductors $L_1$ and $L_2$ are connected in series and are separated by a large distance so that the magnetic field of one cannot affect the other. (a) Show that the equivalent inductance is given by

$$L_{eq} = L_1 + L_2.$$  

(Hint: Review the derivations for resistors in series and capacitors in series. Which is similar here?) (b) What is the generalization of (a) for $N$ inductors in series?

**48 Inductors in parallel.** Two inductors $L_1$ and $L_2$ are connected in parallel and separated by a large distance so that the magnetic field of one cannot affect the other. (a) Show that the equivalent inductance is given by

$$\frac{1}{L_{eq}} = \frac{1}{L_1} + \frac{1}{L_2}.$$ 

79 **SSM** In Fig. 30-69, the battery is ideal and $\mathcal{E} = 10$ V, $R_1 = 5.0$ Ω, $R_2 = 10$ Ω, and $L = 5.0$ H. Switch S is closed at time $t = 0$. Just afterwards, what are (a) $i_1$, (b) $i_2$, (c) the current $i_S$ through the switch, (d) the potential difference $V_2$ across resistor 2, (e) the potential difference $V_L$ across the inductor, and (f) the rate of change $di_2/dt$? A long time later, what are (g) $i_1$, (h) $i_2$, (i) $i_S$, (j) $V_2$, (k) $V_L$, and (l) $di_2/dt$?

![Fig. 30-69 Problem 79.](image)
63 ILW At $t = 0$, a battery is connected to a series arrangement of a resistor and an inductor. If the inductive time constant is 37.0 ms, at what time is the rate at which energy is dissipated in the resistor equal to the rate at which energy is stored in the inductor's magnetic field?

67 SSM A solenoid that is 85.0 cm long has a cross-sectional area of 17.0 cm$^2$. There are 950 turns of wire carrying a current of 6.60 A. (a) Calculate the energy density of the magnetic field inside the solenoid. (b) Find the total energy stored in the magnetic field there (neglect end effects).

13 In an oscillating $LC$ circuit, $L = 3.00 \text{ mH}$ and $C = 2.70 \mu\text{F}$. At $t = 0$ the charge on the capacitor is zero and the current is 2.00 A. (a) What is the maximum charge that will appear on the capacitor? (b) At what earliest time $t > 0$ is the rate at which energy is stored in the capacitor greatest, and (c) what is that greatest rate?

17 ILW In Fig. 31-27, $R = 14.0 \text{ \Omega}$, $C = 6.20 \mu\text{F}$, and $L = 54.0 \text{ mH}$, and the ideal battery has emf $\mathcal{E} = 34.0 \text{ V}$. The switch is kept at $a$ for a long time and then thrown to position $b$. What are the (a) frequency and (b) current amplitude of the resulting oscillations?