You are designing a safety circuit that will discharge a large capacitor \((C = 1 \text{ mF})\) that could be at high voltage \((100 \text{ V})\). When the case is opened by an unwary user, a resistor will be placed in parallel across the capacitor. What element should be used?

A. A wire \((R=0)\)

B. \(R = 1 \Omega, 25 \text{ Watt resistor}\)

C. \(R = 1 \Omega, 100 \text{ Watt resistor}\)

D. \(R = 1 \text{ K}\Omega, 25 \text{ Watt resistor}\)

E. \(R = 1 \text{ M}\Omega, 25 \text{ Watt resistor}\)
The energy stored in the capacitor is \( 0.5 \ C \ v^2 = 5 \ [J] \). Most of this energy will be dissipated in the resistor in one time constant = RC. The wire will probably melt or at least cause a good spark. If \( R = 1 \ \Omega \), the time constant is 1 ms and the power flow will be roughly 5 kW which rules out B and C. At \( R = 1 \ k\Omega \), the time constant is 1 second, which reduces the power to about 5 W, and still seems safe in terms of time. The large resistor will have a 1000 s time constant and doesn’t satisfy the safety goal.