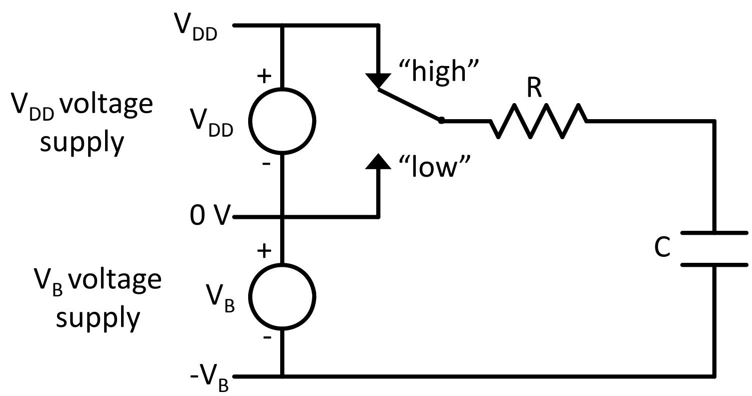
Supplementary question 1

How would the above answers change if the resistor was nonlinear – i.e., the current through it was not proportional to voltage (as could be the case in a transistor or a diode, for example)?

Supplementary question 2

Now consider the circuit below. Here, initially, the switch has been connected in the "low" position for a long time; at the start of our experiment, therefore, the capacitor C has a voltage V_B across it. Then we move the switch to the "high" position and leave it there for a long time, charging the capacitor up to a voltage $V_{TOT} = V_{DD} + V_B$.



(a) What has been the change in the electrostatic energy stored in the capacitor C as a result of moving the switch to the "high" position?

(b) What energy has been dissipated in the resistor R during the charging process?

(c) What energies have been provided by each power supply (i.e., by the V_{DD} power supply and by the V_B power supply)?

(d) What happens to the energy provided by the capacitor C to the circuit when we now connect the switch back to the "low" position?

Supplementary question 3

Can you think of a way in which we can avoid dissipating the energy that the capacitor tries to put back into the V_B power supply?