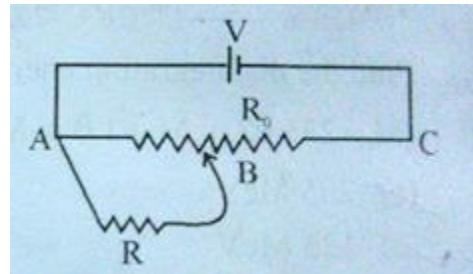


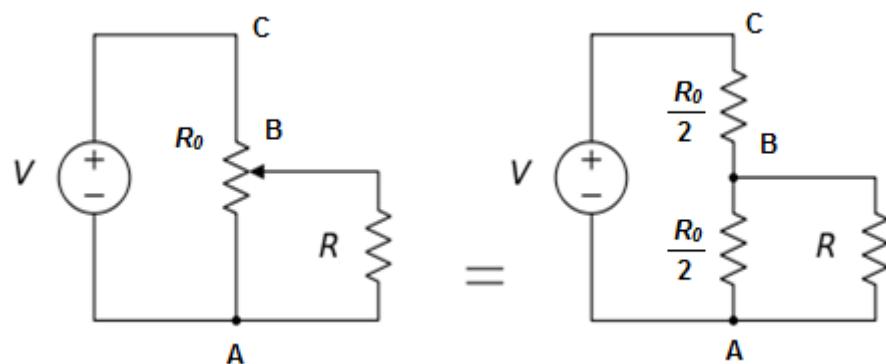
Answer on Question #42890, Physics, Electric Circuits

16. A battery of V voltage is connected across the potentiometer wire AC of total resistance R_0 as shown. Calculate the potential across the resistance R if the sliding contact point B is exactly at the middle of the potentiometer wire:



Solution:

The equivalent scheme is



The total equivalent resistance is

$$R_{eq} = R_{BC} + R_{AB} = \frac{R_0}{2} + \frac{RR_0}{2R + R_0} = \frac{R_0(2R + R_0) + 2RR_0}{2(2R + R_0)} = \frac{R_0(4R + R_0)}{2(2R + R_0)}$$

The current in point C is

$$I_C = \frac{V}{R_{eq}}$$

The voltage across R is

$$V_R = I_C R_{AB} = \frac{V}{R_{eq}} \frac{RR_0}{2R + R_0} = V \frac{2(2R + R_0)}{R_0(4R + R_0)} \frac{RR_0}{2R + R_0} = V \frac{2R}{4R + R_0}$$

Answer: $V_R = \frac{2VR}{R_0 + 4R}$