Exam PHYSICS 2Bb SPRING 2010 QUIZ 4

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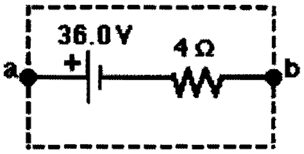
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

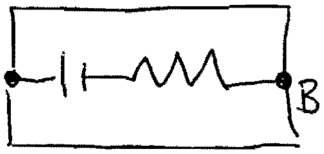
Figure 26.1



The emf and the internal resistance of a battery are as shown.

1) In Figure 26.1, when the terminal voltage V_{ab} is equal to 31.6 V, the current through the battery, including direction, is closest to:

- A) 1.2 A, from a to b
- B) 1.3 A, from b to a
- C) 1.1 A, from a to b
- [✓ D)] 1.1 A, from b to a
- E) 1.2 A, from b to a



assume current goes from B to A

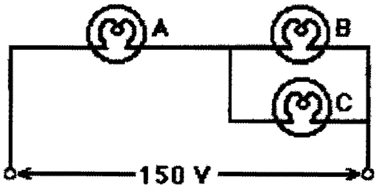
$-I \cdot 4\Omega + 36.0V = 31.6V$

$I \cdot 4\Omega = 4.4 V$

$I = 1.1$ amps

since it is positive we chose direction correctly

Figure 27.1



Three light bulbs, A, B, and C, have electrical ratings as follows:

Bulb A - 96 W, 2.0 A

Bulb B - 200 V, 250 W

Bulb C - 120 V, 0.5 A

The three bulbs are connected in a circuit, which is across a 150-V line, as shown. Assume the filament resistances of the light bulbs are constant and independent of operating conditions.

2) In Figure 27.1, the current through bulb B is closest to:

[✓ A) 0.75 A] B) 1.25 A C) 1.00 A D) 1.10 A E) 0.85 A

light bulbs are basically just resistors, and we need to find what they are $P = I^2R = V^2/R$

$V = IR$

$96 = 4 \cdot R_A$ $\quad R_A = 24\Omega$

$250 = \frac{40000}{R_B}$ $\quad R_B = 160\Omega$

$120 = .5 R_C$ ~~A~~ $R_C = 240\Omega$

$R_{eff} = 24 + \frac{1}{\frac{1}{160} + \frac{1}{240}} \overset{150}{} = 120$

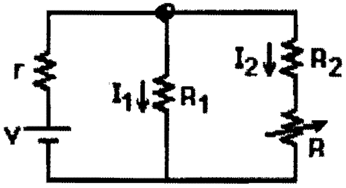
$I_A = I_{total} = \frac{150}{120}$ $\quad V_P = 150 - I_{total} R_A = 120$

$\Delta V_B = 120$

$R_B = 160 \Rightarrow I = .75$

P

Figure 27.5



3) In Figure 27.5, the circuit R is a variable resistance. As R is decreased

~~A) I_1 decreases, I_2 decreases.~~

[✓ B) I_1 decreases, I_2 increases.]

~~C) I_1 increases, I_2 decreases.~~

~~D) I_1 remains unchanged, I_2 increases.~~

~~E) I_1 increases, I_2 increases.~~

as R decreases the resistance of the pieces in parallel decreases thus the total resistance decreases which increases the net current and thus by ohm's law the voltage at point P is decreased (greater I = greater voltage drop accross r)

V_p decreases so I_1 decreases

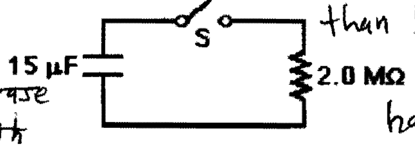
note that since I_1 is now lower than before but I_{tot} is higher and $I_1 + I_2 = I_{tot}$ I_2 must have increased

~~so what matters~~

~~is then does I_2 increase~~

~~even though~~

Figure 27.10



Initially, for the circuit shown, the switch S is open and the capacitor voltage is 80 V. The switch S is closed at time t = 0.

4) In Figure 27.10, the charge on the capacitor, when the current in the circuit is 33 µA, in µC, is closest to:

[✓ A) 1000] B) 900 C) 950 D) 850 E) 800

$$V(t) = V_0 e^{-t/RC} \Rightarrow \text{from } \cancel{Q(t)}\ ) -R\dot{Q}(t) + \frac{Q(t)}{C} = 0$$

$$\text{and } V(t) = \frac{Q(t)}{C} = R\dot{Q}(t)$$

$$I(t) = \frac{V(t)}{R}$$

$$33\mu A = \frac{80}{2\times10^6} e^{-t/RC} \Rightarrow e^{-t/RC} = \frac{33 \cancel{\times10^{-6}} \cdot 2 \cancel{\times10^{6}}}{80}$$

$$Q(t) = Q_0 e^{-t/RC} = C V_0 e^{-t/RC}$$

$$Q(t) = \frac{\overset{15}{\cancel{80}} \times10^{-6} \cdot \cancel{80} \cdot 33 \cdot 2}{\cancel{80}} (\times10^6) \approx 990$$

µC not C