

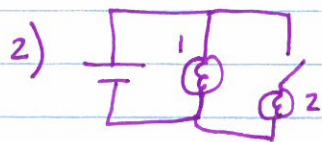
HW 5 p 613 MC 2, 3, 9, 10
C 15

5

p 614 Problems 9, 17, 27
Online Find I by change R
Power in Resistive Circuit

P 613 - Multiple Choice

(B)



2) Identical bulbs in //
how ~~switch~~^{current} change when switch closed?

(1)

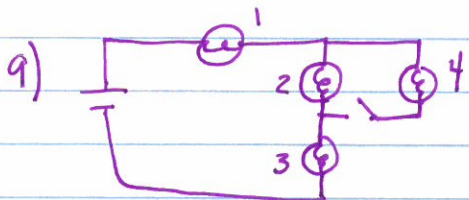
(c) current in 1 does not change (// connect independent)
current in 2 equals 1

(d) current in battery doubles

3) (sam circuit) ^{compare} when potential diff after switch closed

(1)

• Potential diff is same across 1 + 2



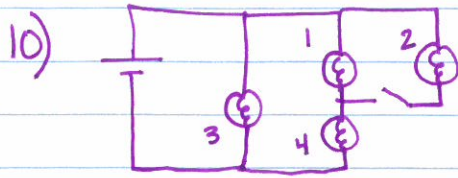
• identical bulbs
• how change when switch closed

(1)

• Req ↓ b/c // branch so I_T ↑

1 + 3 get brighter (b/c I_T ↑ # they get I_T)

2 gets dimmer (splits I_T)



- Four identical bulbs
- How change when switch close

(1)

- 3 same independent path
- 1 gets dimmer - splits current
- 4 gets brighter $\downarrow R_{eq\ 124}$ $\uparrow I_{124}$

- Concept

15) A) How is emf similar to pot diff

- characterize change in E per unit charge or work done per unit charge
- They have same units

B) emf only?

(1)

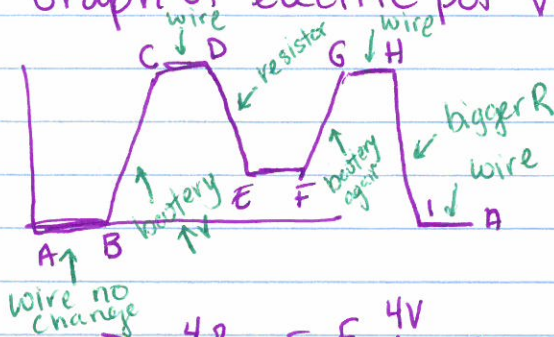
- property of battery
- relates to process that converts mechanical, chemical, light into electrical energy

C) potential diff only?

- characterizes property of E field outside battery
- relates to process that converts electrical to thermal, light, other forms

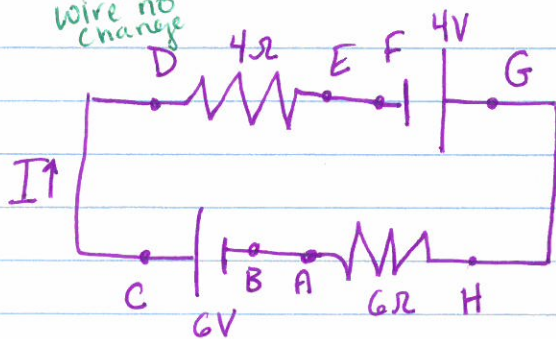
- Problems

9) Graph of electric pot versus location



• Draw a circuit in which change occurs

(1)



17) $R = 50\Omega$
 $\mathcal{E} = 9.0V$
 $r = 1\Omega$

a) $P_{\text{resistor}} = ?$

$$\textcircled{1} I_T = \frac{V_T}{R_T} = \frac{\mathcal{E}}{R+r} = \frac{9.0V}{50\Omega + 1\Omega} = .176A$$

$$\textcircled{2} P = I^2 R = (.176A)^2 (50\Omega) = 1.56W$$

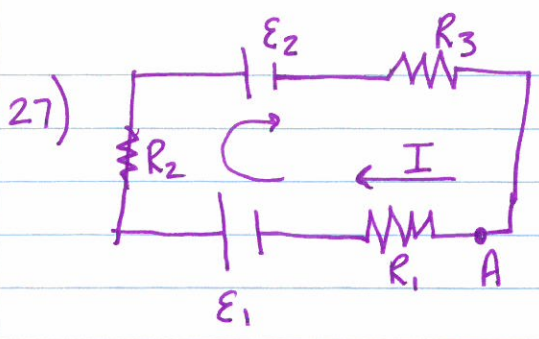
(1)

b) bulb w/ 10Ω dissipate more or less P?

$$\textcircled{1} I_T = \frac{\mathcal{E}}{R+r} = \frac{9.0V}{10\Omega + 1\Omega} = .818A$$

$$\textcircled{2} P = I^2 R = (.818A)^2 (10\Omega) = 6.69W$$

• More power



- $\mathcal{E}_1 = 20V$
- $\mathcal{E}_2 = 8V$
- $R_1 = 30\Omega$
- $R_2 = 20\Omega$
- $R_3 = 10\Omega$

a) Kirchoff's loop rule

$$\mathcal{E}_1 - V_3 - \mathcal{E}_2 - V_2 - V_1 = 0$$

$$\mathcal{E}_1 = V_3 + \mathcal{E}_2 + V_2 + V_1$$

$$\mathcal{E}_1 = IR_3 + \mathcal{E}_2 + IR_2 + IR_1$$

b) $I_T = ?$ $I_T = \frac{V_T}{R_{eq}} = \frac{\mathcal{E}_1 - \mathcal{E}_2}{R_1 + R_2 + R_3} = \frac{20V - 8V}{30\Omega + 20\Omega + 10\Omega} = .20A$

Find ~~the~~ Start at A, go clockwise, find electric pot change
* indicate sign of change

(3)

c) ΔV_{R_1} $\Delta V_{R_1} = -IR_1 = -(.20A)(30\Omega) = -6.0V$

d) \mathcal{E}_1 $\Delta V_{\mathcal{E}_1} = +\mathcal{E}_1 = +20V$

e) ΔV_{R_3} $\Delta V_{R_3} = -IR_3 = -(.20A)(10\Omega) = -2.0V$

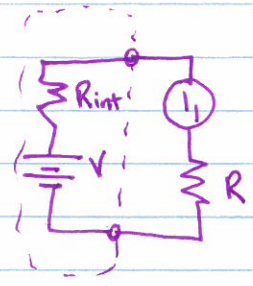
f) \mathcal{E}_2 $\Delta V_{\mathcal{E}_2} = -\mathcal{E}_2 = -8.0V$

g) ΔV_{R_2} $\Delta V_{R_2} = -IR_2 = -(.20A)(20\Omega) = -4.0V$

h) Total for circuit
 $-6.0V + 20V - 2.0V - 8.0V - 4.0V = 0V$

- Online

① Finding current by changing resistors



• battery

- $\mathcal{E} = 8.00V$ $R_1 = 7.00\Omega$
- $R_{int} = ?$ $I_1 = 1.00A$

change R_1 to $R_2 = 5.00\Omega$, new $I_2 = ?$

$$\textcircled{1} \quad \mathcal{E} = I_1 R_{int} + I_1 R_1 \quad R_{int} = \frac{\mathcal{E} - I_1 R_1}{I_1}$$

$$R_{int} = \frac{8.00V - (1.00A)(7.00\Omega)}{1.00A}$$

or $r = \frac{\mathcal{E} - IR}{I}$

$$R_{int} = 1.00\Omega$$

(1)

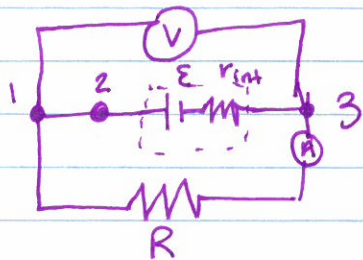
$$\textcircled{2} \quad \mathcal{E} = I_2 R_{int} + I_2 R_2 \quad I_2 = \frac{\mathcal{E} - I_2 R_{int}}{R_2}$$

$$\mathcal{E} = I_2 (R_{int} + R_2)$$

$$I_2 = \frac{\mathcal{E}}{R_{int} + R_2} = \frac{8.00V}{1.00\Omega + 5.00\Omega} = 1.33A$$

- online

② Power in Resistive Electric Circuits



battery w/ ϵ
resistor R
 $r_{int} \neq 0$

current I
voltage V

A) What is I ? $\epsilon = I(R+r)$

$$I = \frac{\epsilon}{R+r_{int}}$$

B) What is V ?

$$V = IR = \frac{\epsilon}{R+r_{int}} \cdot R$$

(2)

$$V = \frac{\epsilon R}{R+r_{int}}$$

C) Power? $P = IV$ (use I, V)
resistor

D) Power? $P = I^2 R$ (use I, r_{int}, R)
resistor

E) Power? $= \left(\frac{\epsilon}{R+r_{int}} \right)^2 R$ (use ϵ, r_{int}, R)
resistor

$$= \frac{\epsilon^2 R}{(R+r_{int})^2}$$