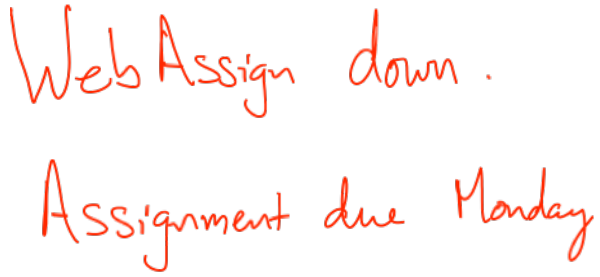
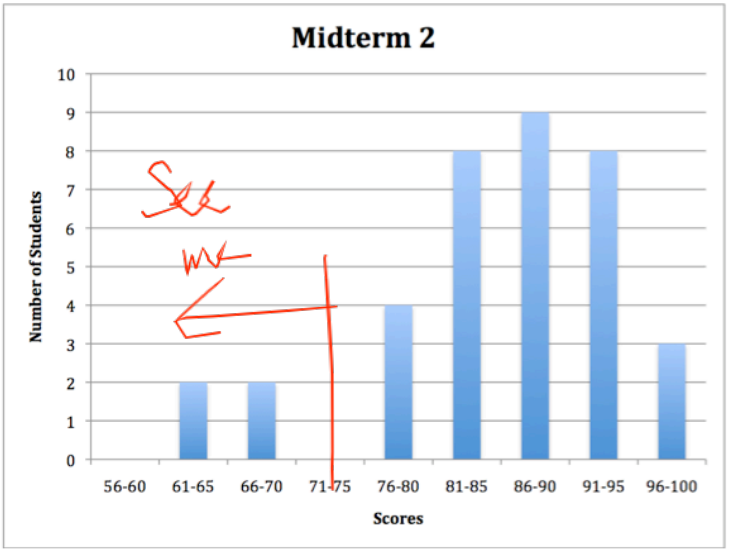
Feb 27

Get Clickers and kits





Mean: 85
Std Dev: 9
Median: 86

Tangible: Fill in the Table

Experiment	Effect on Current (be quantitative)	Circle parameter(s) that changed (explain briefly)
Double the length of a Nichrome wire	$i/2$	n A u (E)
Double the cross-sectional area of a Nichrome wire	$2i$	n (A) u E
Two identical bulbs in series compared to a single bulb	$0.7i$	n A (u) (E)
Two batteries in series compared to a single battery	$2i$	n A u (E)

$\Delta V = -\int E \cdot dl$

$= -EL$

$E \to E/2$

$i = nAuE$

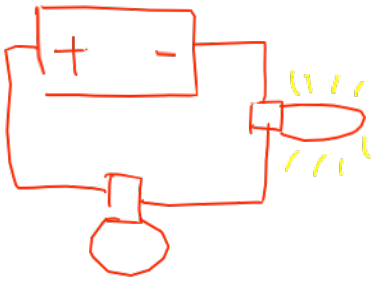
$E \to E/2$

u increases

$\Delta V = -EL$

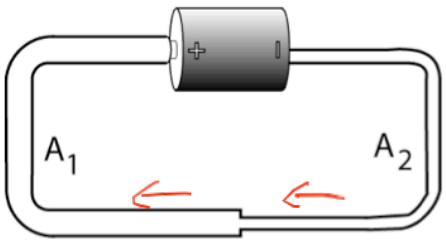
$2\Delta V = -2EL$

Tangible: Mystery circuit



Ponderable: Clicker questions

Q1



$A_1 = 4*A_2$

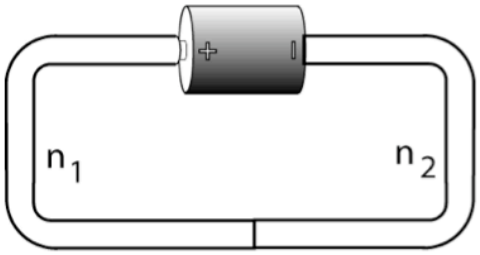
A) $E_1 = 4*E_2$
B) $E_1 = (1/4)*E_2$
C) $E_1 = (1/16)*E_2$
D) $E_1 = 16*E_2$
E) Not enough information

$i_1 = i_2$

$\rho A_1 E_1 = \rho A_2 E_2$

$E_1 = \frac{A_2}{A_1} E_2$

Q2



$n_1 = (1/3)*n_2$

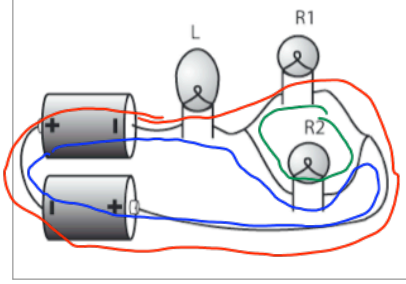
A) $E_1 = 3*E_2$
B) $E_1 = (1/3)*E_2$
C) $E_1 = (1/9)*E_2$
D) $E_1 = 9*E_2$
E) Not enough information

$i_1 = i_2$

$n_1 A u_1 E_1 = n_2 A u_2 E_2$

$\frac{1}{3} n_2 u_1 E_1 = n_2 u_2 E_2$

Q3



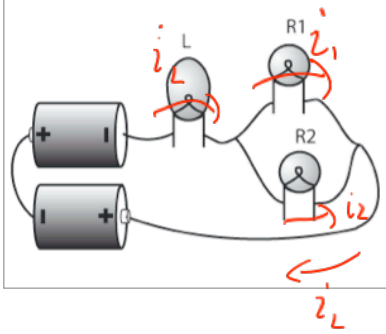
How many different round-trip paths (that go through wires) are there?

A) 1
B) 2
C) 3
D) 4
E) more than 4

Energy Conservation

$\Delta V = 0$ around closed loop

Q4



How many different current node equations are there?

A) 1

B) 2

C) 3

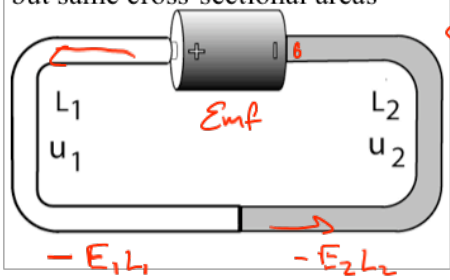
D) 4

E) more than 4

Charge conservation

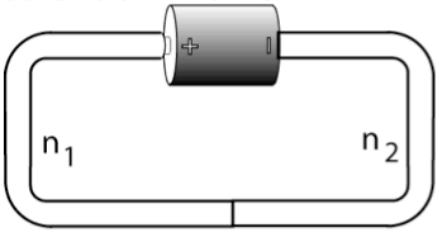
$i_L = i_1 + i_2$

Q18.8c

Wires made of different materials, but same cross-sectional areas	Energy conservation (loop) eqn:
	A) +emf – E_1L_1 – E_2L_2 = 0 B) +emf + E_1L_1 + E_2L_2 = 0 C) +emf – E*(L_1 +L_2) = 0 D) +emf + E*(L_1 +L_2) = 0 E) None of the above

$+ \mathcal{E}mf - E_1L_1 - E_2L_2 = 0$

Q18.10a

Same length L and cross-sectional area, but different materials.  	Same u's, but $n_1 = 2*n_2$ A) E_2 = emf/(1.5*L) B) E_2 = emf/L C) E_2 = emf/(2*L) D) E_2 = 1.5*emf/L

$i_1 = i_2$

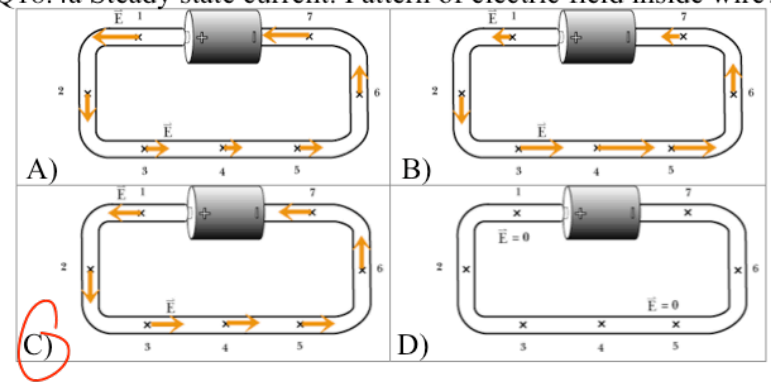
$n_1 \cancel{A_1} \cancel{\mu_1} E_1 = n_2 \cancel{A_2} \cancel{\mu_2} E_2$

$2 n_2 E_1 = n_2 E_2 \Rightarrow E_1 = \frac{1}{2} E_2$

$\mathcal{E}mf - E_1 L - E_2 L = 0$

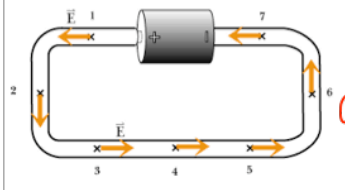
$\mathcal{E}mf - L\left(\frac{1}{2} E_2 + E_2\right) = 0 \Rightarrow E_2 = \frac{\mathcal{E}mf}{1.5L}$

Q18.4a Steady state current: Pattern of electric field inside wire?



$i = nAuE$

Q4



What charges make the electric field inside the wire in this circuit?

A) The moving electrons inside the wire
B) Charges on the battery and surface of the wire
C) Only charges on the battery
D) Only charges on the surface of the wire

Q18.8d

Circuit 1: 1 battery, NiCr wire length L cross-sectional area A electric field E_1 inside wire Circuit 2: 1 battery, NiCr wire length (3L) cross-sectional area A electric field E_2 inside wire.	Which statement is correct? A) $E_1 = E_2$ B) $E_1 = 3*E_2$ C) $E_1 = E_2/3$

$\mathcal{E}mf - E_1 L = 0$

$\mathcal{E}mf - E_2(3L) = 0$

$E_1 L = E_2(3L)$

Q18.8e

Circuit 1: 1 battery, NiCr wire length L cross-sectional area A electric field E_1 inside wire Circuit 2: 1 battery, NiCr wire length L cross-sectional area (4A) electric field E_2 inside wire.	Which statement is correct? A) $E_1 = E_2$ B) $E_1 = 4*E_2$ C) $E_1 = E_2/4$

$\mathcal{E}mf - E_1 L = 0$

$\mathcal{E}mf - E_2 L = 0$

$E_1 L = E_2 L$

Q18.8f

Circuit 1: 1 battery, NiCr wire length L cross-sectional area A Circuit 2: 1 battery, NiCr wire length L cross-sectional area (4A)	Which statement is correct? A) $i_1 = i_2$ B) $i_1 = 4*i_2$ C) $i_1 = i_2/4$

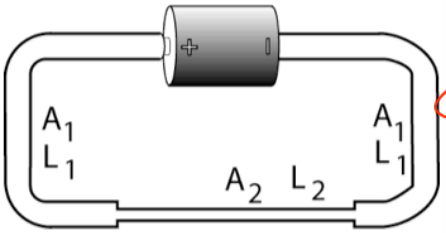
$i_1 = nAuE_1$ $\quad E_1 = E_2$

$i_2 = n4AuE_2$

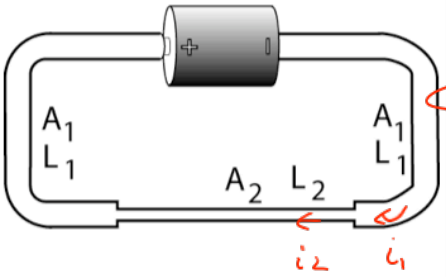
$= 4(nAuE_1)$

$= 4\,i_1 \quad \Rightarrow i_1 = \frac{i_2}{4}$

Q18.8b

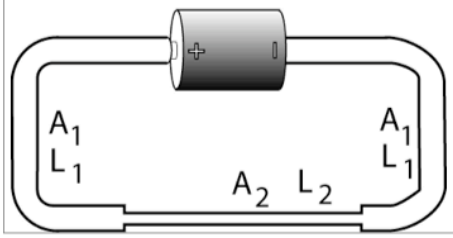
Wires made of same material	Energy conservation (loop) eqn:
	A) $+emf - E*(2L_1 + L_2) = 0$ B) $+emf + E*(2L_1 + L_2) = 0$ C) $+emf - 2E_1L_1 - E_2L_2 = 0$ D) $+emf + 2E_1L_1 - E_2L_2 = 0$ E) None of the above

Q18.8a

Wires made of same material	Current conservation (node) eqn:
	A) $i_1 = 2*i_2$ B) $2i_1 = i_2$ C) $i_1 = i_2$ D) $i_1 = (A_2/A_1)*i_2$ E) None of the above

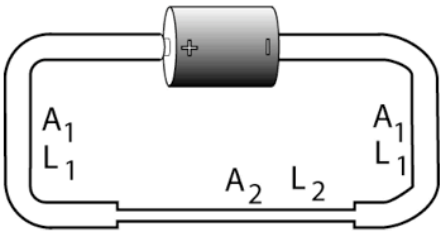
Q18.10b

$n = 9e28$ electrons/m^3	$u = 7e\text{-}5$	What is E_2?
(m/s)/(V/m)		A) 50.4 V/m
$L_1 = 0.2$ m	$L_2 = 0.05$ m	B) 12.9 V/m
$A_1 = 9e\text{-}8$ m^2	$A_2 = 1.5e\text{-}8$	C) 3.15 V/m
m^2		D) 0.788 V/m
		E) Not enough information

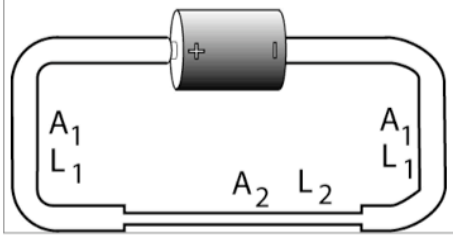


Q18.10b Battery emf = 1.5 V

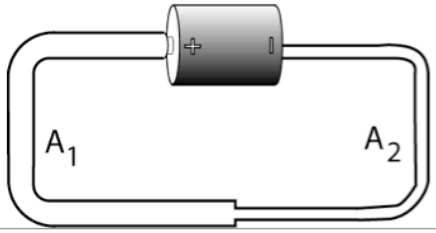
n = 9e28 electrons/m^3	u = 7e-5 (m/s)/(V/m)	What must we do to find the current?
L_1 = 0.2 m	L_2 = 0.05 m	
A_1 = 9e-8 m^2	A_2 = 1.5e-8 m^2	A) Solve for E_1 B) Solve for E_2 C) Solve for E_1 and E_2 D) Not enough information



Q18.10b Battery emf = 1.5 V

n = 9e28 electrons/m^3 u = 7e-5 (m/s)/(V/m) L_1 = 0.2 m L_2 = 0.05 m A_1 = 9e-8 m^2 A_2 = 1.5e-8 m^2  	What is E_2? A) 50.4 V/m B) 12.9 V/m C) 3.15 V/m D) 0.788 V/m E) Not enough information

Q18.3b Wires made of same material.
Drift speed of electrons in thick wire vs. drift speed of electrons in thin wire?



A) $v_1 > v_2$
B) $v_1 = v_2$
C) $v_1 < v_2$
D) Not enough information

$i_1 = nA_1\bar{v}_1$

$i_2 = nA_2\bar{v}_2$

$i_1 = i_2$

$A_1\bar{v}_1 = A_2\bar{v}_2$