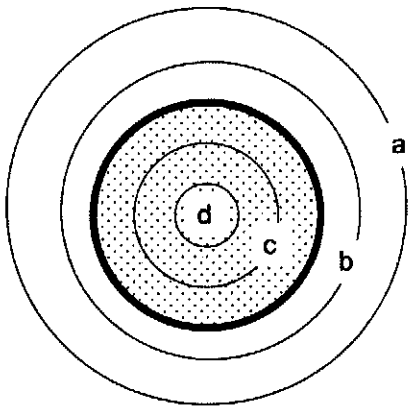
Physics 2102 Section 004 Dowling

March 08, 2007 Quiz 13 Name (print): SOLUTION

A wire with uniform current density J is shown in cross section, with the current coming out of the page towards you. Four Amperian loops are shown. Choose from the list below the correct ranking of the magnitude of the value of line integral $\Sigma = \oint \mathbf{B} \cdot ds$ around each loop.



(Circle One.)

$\Sigma_a = \Sigma_b = \Sigma_c = \Sigma_d$

$\Sigma_a = \Sigma_b > \Sigma_c > \Sigma_d$

$\Sigma_a > \Sigma_b > \Sigma_c > \Sigma_d$

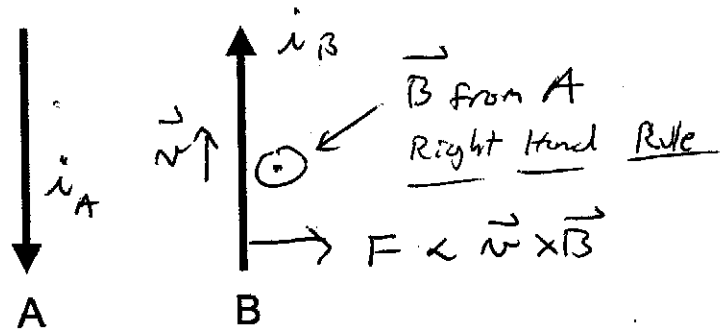
$\Sigma = \oint \vec{B} \cdot \vec{ds} \propto I_{ENC}$

c encloses more than d but a and b enclose the same

Physics 2102 Section 004 Dowling

March 13, 2007 Quiz 14 Name (print): SOLUTION

Two identical wires carry currents of equal magnitude but opposite direction, as shown in the figure.



Which way does the *force* on wire *B* due to wire *A point?*

(Circle One.) Antiparallel repel!

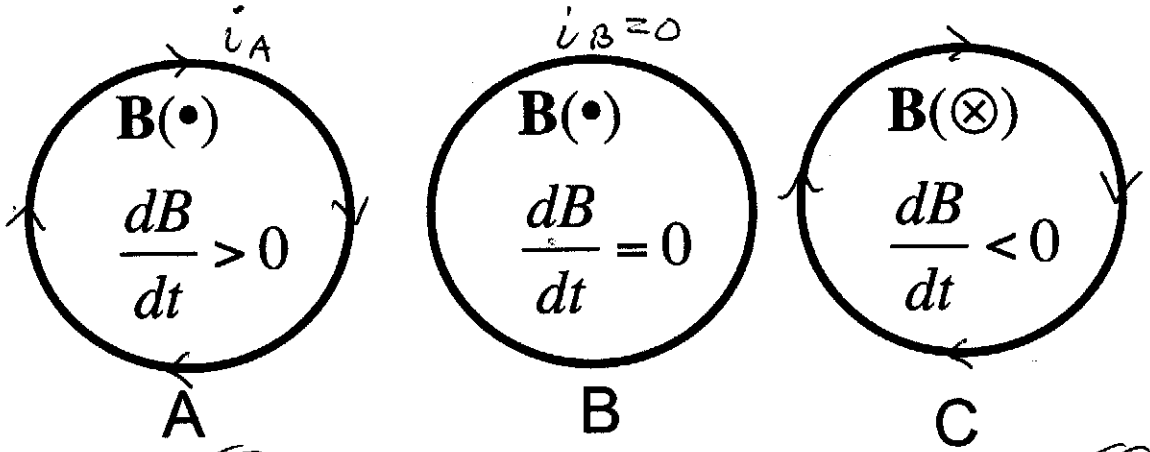
To the right (→)

To the left (←)

Out of the page (•)

Physics 2102 Section 004 Dowling

March 15, 2007 Quiz 15 Name (print): SOLUTION



B_{ind} = (X) oppose $B_{ind} = 0$ B_{ind} = (X) boost

Alice, Bob, and Charlie have taken three identical wire loops and prepared a different magnetic field B going through each loop. The direction and time rate of change for each loop is indicated in the figure. They can't figure out which way the current now flows in the loop. Help them out by circling one answer each below for clockwise (CW) counterclockwise (CCW) or no current flow (NONE).

(Circle One Each.)

A:	(CW)	CCW	NONE
B:	CW	CCW	(NONE)
C:	(CW)	CCW	NONE

Use Lenz's Law

A: Current produces B_{ind} to oppose decrease.

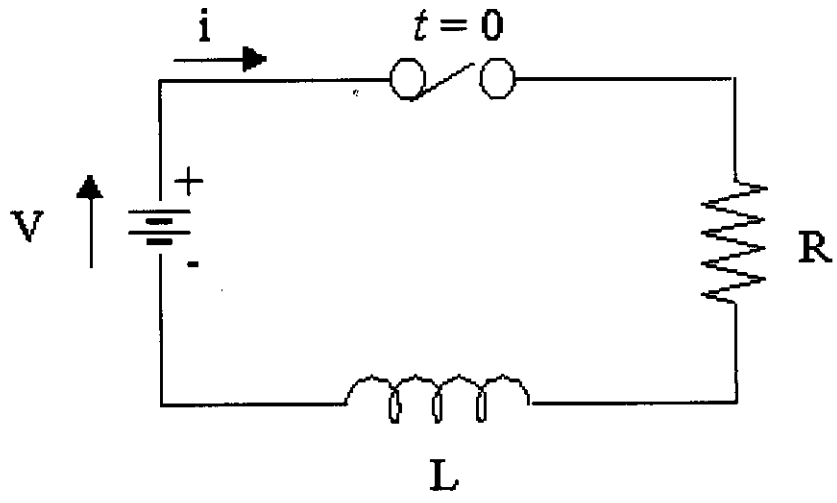
B: No change $\Rightarrow \frac{d\Phi}{dt} = 0 \Rightarrow i = 0$

C: Current produces B_{ind} to boost decrease.

Physics 2102 Section 004 Dowling

March 20, 2007 Quiz 16 Name (print): SOLUTION

In the RL circuit the switch is closed at t=0 as shown.



(a) What is the current i at t=0? At $t=0$ L acts like open circuit with no current $\boxed{i = 0}$

(b) What is the current i after a very long time?

$t=\infty$ L acts like wire — short circuit — $\boxed{V = iR}$

$\boxed{i = V/R}$ ANS $= 1V/1\Omega = \boxed{1\,A}$ ANS

(c) If R=1Ω, V=1V, and L=1H, what is the current after t=1 second?

For LR "charging" $\tau_{LR} = L/R = 1\,s$

$$i(t) = \frac{V}{R}\left(1 - e^{-t/\tau_{LR}}\right)$$

$$= \frac{1V}{1\Omega}\left(1 - e^{-1}\right) \overset{ANS}{=} \boxed{1 - e^{-1}\ A}$$

$$\approx \boxed{0.63\ A}\ ANS$$