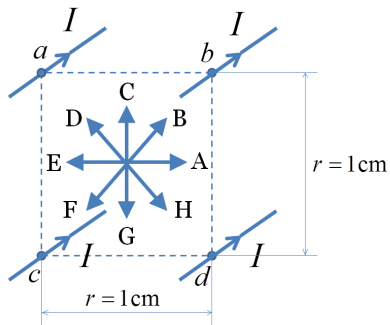
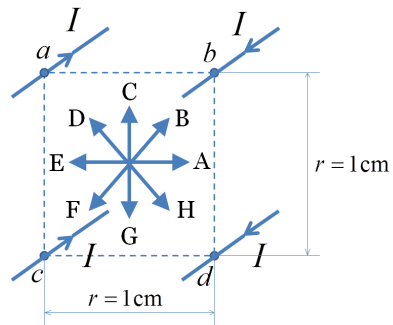


Physics 1214, Midterm II (10/15)

M1 Four long wires are attached to the corners of a square perpendicular to its surface. Each wire carries the same current  $I$ . What is the direction of the net magnetic field in the center of the square? Write the letter of the arrow parallel to the field direction or 0 if you believe that the field is zero.



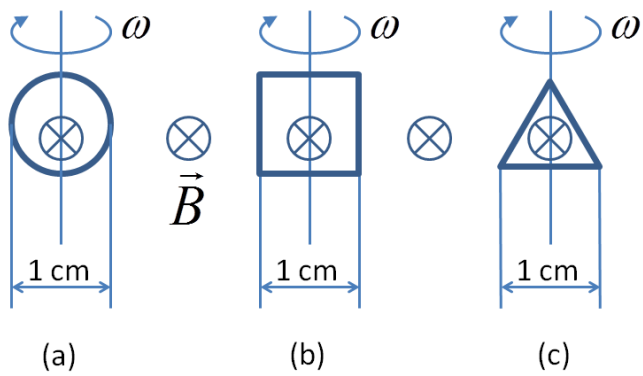
(1) Field direction: \_\_\_\_\_



(2) Field direction: \_\_\_\_\_

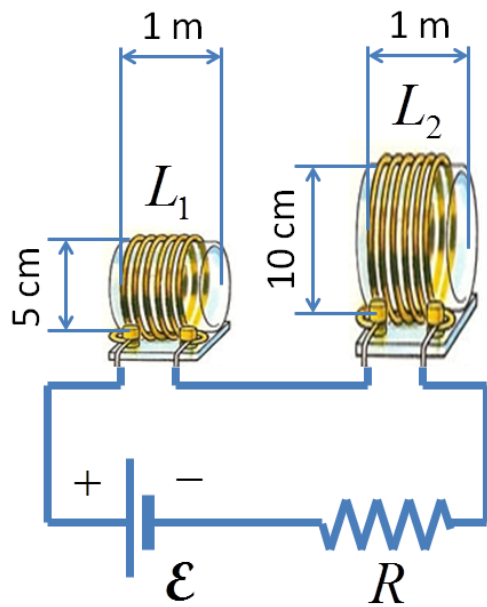
M2 Three wire frames (a circle, a square, and an equilateral triangle) are rotating with the same angular velocity  $\omega$  in a constant magnetic field  $B$ . In which case the amplitude of induced emf is the largest?

- A. a.
- B. b.
- C. c.
- D. The same in all cases.



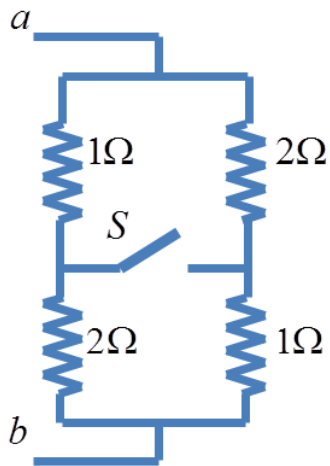
M3 Two ideal solenoids  $L_1$  and  $L_2$  are connected as shown below. Each solenoid has  $N = 1000$  turns. Assuming that the solenoids are far away from each other so one can neglect their mutual inductance, what is the ratio of the magnetic fields in the centers of the solenoids  $B_1/B_2$ ?

- A.  $1/4$
- B.  $1/2$
- C. 1
- D. 2
- E. 4

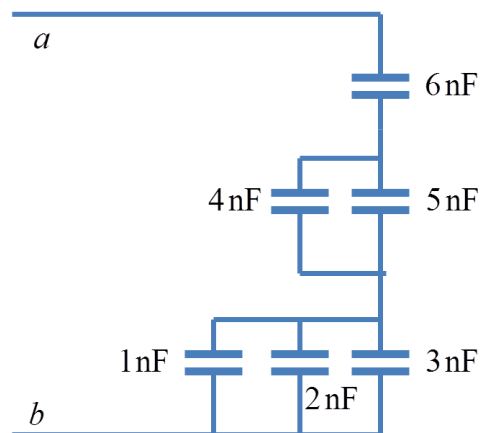


M4 A circuit is made of four resistors and a switch  $S$ , as shown below. If the switch is closed, the equivalent resistance of the circuit

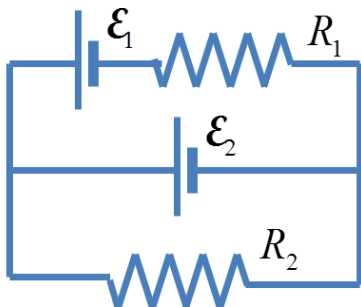
- A. increases.
- B. stays the same.
- C. decreases.



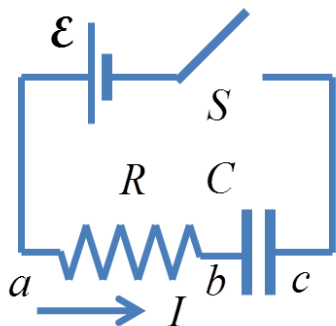
P1 Find the equivalent capacitance of the circuit shown below.



P2 In the circuit below,  $\mathcal{E}_1 = 10 \text{ V}$ ,  $\mathcal{E}_2 = 5 \text{ V}$ ,  $R_1 = 50 \Omega$ ,  $R_2 = 10 \Omega$ . Calculate the current through battery  $\mathcal{E}_2$ .



P3 An uncharged  $RC$  circuit ( $R = 100 \Omega$ ,  $C = 10 \mu\text{F}$ ) is connected to a battery. At time  $t=1.5 \text{ ms}$  after the switch is closed, the current in the circuit is  $22 \text{ mA}$ . What is the battery voltage?



P4 In a slide-wire generator, a 1 cm rod moving at velocity 1 cm/s generates induced emf 0.001 V. What is the magnetic field?