

Instructor(s):

PHYSICS DEPARTMENT
EXAM I

February 10, 2010

Name (print, last first): _____

Signature: _____

*On my honor, I have neither given nor received unauthorized aid on this examination.***YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.**

- (1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number).** Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY.** Code your UFID number on your answer sheet.
- (2) Print your name on this sheet and sign it also.
- (3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout.
- (4) **Blacken the circle of your intended answer completely, using a #2 pencil or blue or black ink.** Do not make any stray marks or some answers may be counted as incorrect.
- (5) The answers are rounded off. Choose the closest to exact. There is no penalty for guessing.
- (6) **Hand in the answer sheet separately.**

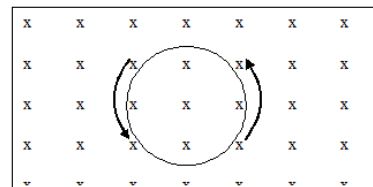
Physical Constants:

$g = 9.8 \text{ m/s}^2$	$m_e = 9.11 \times 10^{-31} \text{ Kg}$
$m_p = 1.67 \times 10^{-27} \text{ Kg}$	$e = 1.6 \times 10^{-19} \text{ C}$
constant k in Coulomb's Law: $k = 9 \times 10^9 \text{ Nm}^2/\text{C}^2$	
$\mu_o = 4\pi \times 10^{-7} \text{ N/A}^2$	$\epsilon_o = 8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$

1. (2 points) A sodium ion ($q = +e, m = 23 \times 10^{-27} \text{ kg}$) is moving with speed $3 \times 10^4 \text{ m/s}$ perpendicular to a magnetic field. What must be the magnitude of the field if the particle is to follow a circle with 0.4 m radius? (in tesla)

- (1) 0.0108 (2) 0.036 (3) 0.09 (4) 0.36 (5) 0.72

2. (2 points) A circular conducting loop is lying on the plane perpendicular to a uniform magnetic field as shown in the figure below. A current is made to flow in the direction as shown in the figure. The magnetic field exerts on the loop



- (1) no net force and no net torque.
 (2) net force only.
 (3) net torque only.
 (4) net force and net torque.
 (5) not enough information.

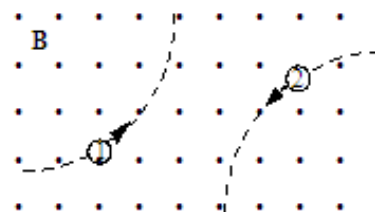
3. (2 points) Two coils (#1 and #2) made out of the same wire are in a uniform magnetic field with the coil axis aligned in the field direction. Coil #1 has 10 turns of loop with a radius of 5 cm and coil #2 has 5 turns with a radius of 10 cm. Now the field strength is doubled in 2 s. What is the ratio of the emf induced in each coil ($emf_1 : emf_2$).

- (1) 1:2 (2) 1:1 (3) 2:1 (4) 1:4 (5) not enough information

4. (2 points) A $100 \mu\text{F}$ capacitor is charged to have 3 V potential difference across the capacitor. The charge stored in the capacitor is discharged through $100 \text{ k}\Omega$ resistor for 10 s. How much charge is left in the capacitor? (in C)

- (1) 1.11×10^{-4} (2) 3×10^{-4} (3) 0 (4) not enough information (5) 1.6×10^{-19}

5. (1 point) Two particles move through a uniform magnetic field that is directed out of the plane of the page. The figure shows the paths taken by the two particles as they move through the field. The particles are not subject to any other forces or fields. Which one of the following statements concerning these particles is true?



- (1) Particle 1 is negatively charged; 2 is negative.
 (2) The particles may both be neutral.
 (3) Particle 1 is positively charged; 2 is negative.
 (4) Particle 1 is positively charged; 2 is positive.
 (5) Particle 1 is negatively charged; 2 is positive.

