Instructor(s): *Z. Qiu*

PHYSICS DEPARTMENT

PHY2005, Spring 2011 EXAM II February 23, 2011

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. If you believe that no listed answer is correct, leave the form blank.**
(6) Hand in the answer sheet separately.

Physical Constants:

$g = 9.8$ m/s^2	$m_e = 9.11 \times 10^{-31}$ Kg	$m_p = 1.67 \times 10^{27}$ Kg
$e = 1.6 \times 10^{-19}$ C	constant k in Coulomb's Law: $k = 8.99 \times 10^9$ Nm^2/C^2	
$\mu_o = 4\pi \times 10^{-7}$ N/A^2	$\varepsilon_o = 8.85 \times 10^{-12}$ C^2/Nm^2	

1. A solenoid with 1500 turns, 0.40 m long, carrying a current of 2.0 A and with a radius of 10^{-2}m will have what strength magnetic field at its center?

(1) 94×10^{-4}T (2) 19×10^{-4}T (3) 31×10^{-4}T (4) 62×10^{-4}T (5) 46×10^{-4}T

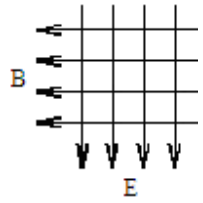
2. A proton is released such that it has an initial speed of 8.0×10^5m/s from left to right across the page. A magnetic field of 1.8 T is present at an angle of 30° to the horizontal direction (or positive x axis). What is the magnitude of the force experienced by the proton? ($q_p = 1.6 \times 10^{-19}$C)

(1) 11.5×10^{-14} N (2) 3.9×10^{-19} N (3) 14.4×10^{-25} N (4) 22.5×10^3 N (5) 27.2×10^{-17} N

3. Two singly ionized elements, X and Y, move with the same speed perpendicular to a uniform magnetic field. Element X follows a path of radius 1.65 cm while element Y moves along a path 2.53 cm in radius. What is the ratio of the two element masses, m_X/m_Y?

(1) 0.65 (2) 1.9 (3) 1.5 (4) 0.79 (5) 2.17

4. An electron moves through a region of crossed electric and magnetic fields. The electric field $E = 2400$ V/m and is directed straight down. The magnetic field $B = 0.70$ T and is directed to the left. For what velocity v of the electron into the paper will the electric force exactly cancel the magnetic force?



(1) 3400 m/s (2) 4800 m/s (3) 5200 m/s (4) 8700 m/s (5) 7300 m/s

5. A square coil, enclosing an area with sides 8.0 cm long, is wrapped with 5000 turns of wire. A uniform magnetic field perpendicular to its plane is turned on and increases to 0.75 T during an interval of 3.0 s. What average voltage is induced in the coil?

(1) 8.0 V (2) 4.0 V (3) 32.0 V (4) 40.0 V (5) 16.0 V

6. A 500-turn circular coil with an area of 0.050 0 m^2 is mounted on a rotating frame, which turns at a rate of 20.0 rad/s in the presence of a 0.050 0-T uniform magnetic field that is perpendicular to the axis of rotation. What is the instantaneous emf in the coil at the moment that the normal to its plane is parallel to the field?

   (1) zero (2) 125 V (3) 216 V (4) 250 V (5) 62.5 V

7. Which one of the following statements concerning the magnetic force on a charged particle in a magnetic field is true?

   (1) It depends on the component of the particle's velocity that is perpendicular to the field.
   (2) It is a maximum if the particle is stationary.
   (3) It is zero if the particle moves perpendicular to the field.
   (4) It is a maximum if the particle moves parallel to the field.
   (5) It acts in the direction of motion for a positively charged particle.

8. In the inductor of a 60-Hz AC series circuit, the peak voltage precedes the peak current in each cycle by what time interval?

   (1) 4.2×10^{-3}s (2) 2.1×10^{-3}s (3) 8.3×10^{-3}s (4) 1.7×10^{-3}s (5) 3.4×10^{-3}s

9. An AC series circuit has 36.0Ω resistance, 45.0Ω inductive reactance and 25.0Ω capacitive reactance. If an effective (rms) emf of 120 V is applied, what is the effective (rms) current value?

   (1) 2.91 A (2) 2.26 A (3) 7.83 A (4) 11.0 A (5) 1.29 A

10. Find the resonant frequency for a series RLC circuit where $R = 20.0\Omega$, $C = 40.0\mu$F, and $L = 8.0$mH.

    (1) 281 Hz (2) 187 Hz (3) 1.63 kHz (4) 7.07 kHz (5) 0.912 kHz