Phys2020: Exam 3 Practice for April 14, '16. 7:30-9:15 PM

Your Name (please print neatly!) ____________________________

Student ID # ____

TA's name (**Circle one!!**)

Robert Ariniello	Nicholas Kellaris	Prasanth Prahladan
Thomas Gray	Andrew Spott	Shane Rightley

Day your lab meets (**Circle one!!**) Tue Wed Thu

Time your lab starts (**Circle one!!**) 8 10 12 2 4

Please follow these instructions before you start the exam!

- [ ] Fill in the lines above, and *circle* your TA + the day and time of your lab.
- [ ] Write in ***and*** *bubble in* your name *and* your ID # on the bubble sheet!
- [ ] Write ***and*** *bubble* the exam version **(A)** in the space (top left of the bubble sheet.)

Double check all of the above! Then, please wait until a TA announces you may begin.

There will be about 25 **multiple choice questions**

Please BUBBLE IN your answer on the bubble sheet. Answers circled on this exam will NOT be used for grading purposes!! Use a #2 pencil. Erase mistakes carefully.
If you can't thoroughly erase, ask for a fresh bubble sheet.
At the end, *check* that you have bubbled in *one* answer only, for all questions.

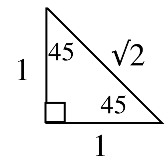
All questions are weighted the same (so don't let yourself get "stuck" on one problem, move on, come back if you have time!)

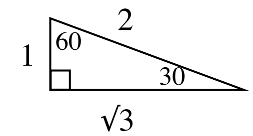
PLEASE turn in your exam in the **proper pile** up front! Ask if it's confusing - thanks!

> **"On my honor, as a University of Colorado at Boulder student, I have neither given nor received unauthorized assistance on this work"**

Signature ____

This exam is double sided, please look at the backs of pages!





Useful constants:

k = 9x10^9 N m^2/C^2, μ_0 = 4 π x10^{-7} T m/A
e = 1.6x10^{-19} C, c = 3x10^8 m/s

On this exam, neglect gravitational forces unless we explicitly say otherwise.

Some Units:
Units of [force] = [N] = [kg*m/s^2],
Units of [energy or work] = [J] = [N*m] = [kg*m^2/s^2], [Power] = [J/s], Intensity = [J/(s*m^2)]
Units are Current = C/s, Units of resistance is Ω=Ohm=[J s/C^2] Unit of resistivity is [Ω*m]
Units of Magnetic field = [T] = [N/(C*m/s)] = [kg/(C*s)]

Useful Formulas:
Newton's 2nd Law: $\vec{F}_{net} = m\vec{a}$, Work = $\mathbf{\vec{F}} \cdot \mathbf{\vec{d}}$ = |F||d| cosθ, Power = $\vec{\boldsymbol{F}} \cdot \vec{\boldsymbol{v}} = |F||v|cos\theta$
Coulomb's Law: $|F_{elec}| = \frac{k|q_1||q_2|}{r^2}$

Electric Fields:
$\vec{E} = \vec{F}/q$. Special cases of the above: $\left|E_{near\ a\ point\ charge}\right| = \frac{k|q|}{r^2}$

Electric Potential (or "Voltage")
$\Delta V = \frac{\Delta PE}{q}$. Special cases of the above: $V_{near\ a\ point\ charge\ q} = \frac{kq}{r}$
For uniform fields (or short distances), $\left|\vec{E}\right| = \left|\frac{\Delta V}{\Delta d}\right|$

Capacitors:
$Q = C\Delta V,\ C_{parallel\ plate} = \frac{A}{4\pi k\ d},\ \ |E|_{parallel\ plate} = \frac{4\pi kQ}{A},$
Stored energy in capacitor: $U = \frac{1}{2}C(\Delta V)^2 = \frac{1}{2}\frac{Q^2}{C} = \frac{1}{2}Q\Delta V$

Currents and circuits
Current is charge passing per second. Resistance is $R = \rho L/A$, where ρ = resistivity
$\Delta V = IR$ across a resistor, and power dissipated is $P = I\Delta V = I^2R = \Delta V^2/R$
Resistors in series add up, resistors in parallel obey $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots$

Magnetic fields
Force on a wire in a B-field: $F = I * length * B * \sin\theta$, direction given by a "right hand rule"
Force on a moving charge in a magnetic field is $F = q\ v\ B \sin\theta$ (again, "right hand rule")
Special case: $|B_{near\ wire}| = \frac{\mu_0}{2\pi}\frac{I}{r}$. In uniform B-field, charges move in circles, with $R = \frac{mv}{qB}$.

Faraday's law
$EMF = -N\frac{\Delta\Phi_{mag}}{\Delta t}, where\ \Phi_{mag} = BAcos\theta$, and N is the number of turns (or coils)
(Lenz' law is the minus sign in the above equation!)

Electromagnetic Waves (radiation)
For any wave with speed v, λf = v, and speed of light in vacuum = c = 3E8 m/s,
Frequency f = 1/period, [f] = [Hz = cycles/sec]