Phys2020: Exam 1, Version A, Mar 12, '15. 7:30-9:15 PM

Your Name (please print neatly!) _____

For grader use

Student ID # _____

A	
B	
C	
D	

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

Oscar Henriksson Adam Higuera Ian Leahy

Nick Pellatz Devin Rourke Keith Tauscher

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 the above! Then, please wait until a TA announces you may begin.

There are XX **multiple choice questions** followed by XX pages of **long answer questions**

For **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.

Multiple choice problems are YY pts each

Long answer questions: Write **on this exam** (not the bubble sheet). Please write neatly! Long answer problem parts are worth ZZ pts each

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

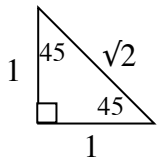
"On my honor, as a University of Colorado at Boulder student, I have neither given nor received unauthorized assistance on this work"

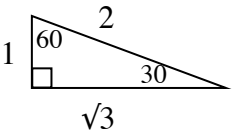
Signature _____

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,





On this exam, please 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]
Units are Current = C/s, Units of resistance is Ω=Ohm=[J s/C^2] Unit of resistivity is [Ω*m]

Useful Formulas:
Newton's Second Law
$\vec{F}_{net} = m\vec{a}$
Work = $\vec{\mathbf{F}} \cdot \vec{\mathbf{d}}$,

Coulomb's Law
$|F_{elec}| = \frac{k|q_1||q_2|}{r^2}$

Electric Fields
$\vec{E} = \frac{\vec{F}}{q}$
Special cases of the above: $\left|E_{near\ a\ point\ charge}\right| = \frac{k|q|}{r^2}$
For uniform fields (or short distances), $\left|\vec{E}\right| = \left|\frac{\Delta V}{\Delta d}\right|$

Electric Potential (or "Voltage")
$\Delta V = \frac{\Delta PE}{q}$
Special cases of the above: $V_{near\ a\ point\ charge\ q} = \frac{kq}{r}$
$\Delta V_{in\ uniform\ field} = -Ed$ (where d is the distance parallel to the electric field)

Capacitors
$Q = C\Delta V,\ C_{parallel\ plate} = \frac{A}{4\pi k\ d}$, 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 is $F = I * length * B * \sin\theta$, direction given by a "right hand rule)
Force on a moving charge in a magnetic field is $F = q\ v\ B \sin\theta$ (again, a "right hand rule")
Special case: $\left|B_{near\ a\ long\ wire}\right| = \frac{\mu_0}{2\pi}\frac{I}{r}$