

Version

Quiz #3 Form #325

Name: _____

A

Physics 2212 K Summer 2015

Recitation Section: _____

- Print your name, quiz form number (3 digits at the top of this form), and student number (9 digit Georgia Tech ID number) in the section of the answer card labeled "Student Identification."
- Bubble the Quiz Form Number in columns 1–3, skip column 4, then bubble your Student Number in columns 5–13.
- Free-response questions are numbered I–II. For each, make no marks and leave no space on your card. Show all your work clearly, including all steps and logic. Box your answer.
- Multiple-choice questions are numbered 1–10. For each, select the answer most nearly correct, circle this answer on your quiz, and bubble it on your answer card. Do not put any extra marks on the card.
- Turn in your quiz and answer card as you leave. Your score will be posted when your quiz has been graded. Quiz grades become final when the next quiz is given.
- You may not use a calculator or any other aids or electronic devices.

 e Fundamental charge m_e Mass of an electron K Coulomb constant $= 1/4\pi\epsilon_0$ g Magnitude of Free Fall Acceleration*Unless otherwise directed, all wires and batteries are ideal.**Any integrals in free-response problems must be evaluated. Questions about magnitudes will state so explicitly.*

George P. Burdell

123 900987654

WRITTEN information for human benefit

Test Form Number from YOUR test

column 4 is blank

YOUR student number starts in column 5

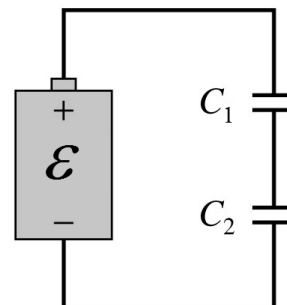
Your answers

YOUR form number is **325**

Recitation Sections

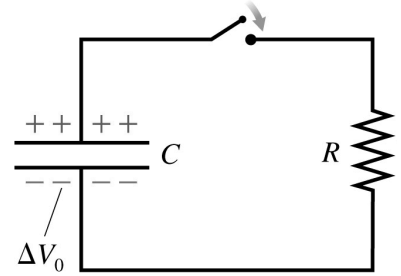
	Room 125
TUESDAY	
2:20–3:10 pm	K04 Sharma, Kamal
3:20–4:10 pm	K03 Sharma, Kamal
4:20–5:10 pm	K01 Koh, Daegene
WEDNESDAY	
2:20–3:10 pm	K06 Krygier, Michael
3:20–4:10 pm	K05 Krygier, Michael
4:20–5:10 pm	K02 Koh, Daegene
THURSDAY	
2:20–3:10 pm	K08 Nguyen, Khai
3:20–4:10 pm	
4:20–5:10 pm	K09 Nguyen, Khai

-
- I. (20 points) A battery with an emf $\mathcal{E}$ is connected to the two capacitors as shown. Afterward, the charge on capacitor C_2 is Q . What is the capacitance of C_2 in terms of any or all of C_1 , Q , and $\mathcal{E}$, and physical or mathematical constants?



1. (6 points) Consider the ratio of the energies stored in the capacitors above, U_1/U_2 . If the emf of the battery was doubled, how would the new ratio of energies, U'_1/U'_2 , compare to the original ratio?
- (a) $U'_1/U'_2 = \frac{1}{4}U_1/U_2$
 - (b) $U'_1/U'_2 = \frac{1}{2}U_1/U_2$
 - (c) $U'_1/U'_2 = U_1/U_2$
 - (d) $U'_1/U'_2 = 2U_1/U_2$
 - (e) $U'_1/U'_2 = 4U_1/U_2$

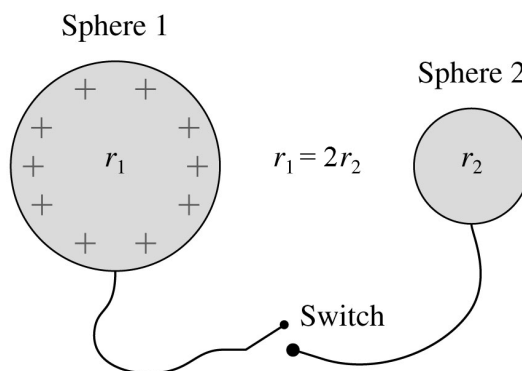
-
- II. (20 points) A capacitor with initial potential difference ΔV_0 is discharged through a resistor when the switch is closed at time $t = 0$. At time $t = T$, the potential difference across the capacitor is $\Delta V = \Delta V_0/10$. What was the potential difference across the capacitor at time $t = T/2$?



2. (6 points) As the magnitude of the potential difference across the capacitor decreases with time in the problem above, how, if at all, does the magnitude of the potential difference across the resistor change?
- (a) The magnitude of the potential difference across the resistor decreases.
 - (b) The magnitude of the potential difference across the resistor remains constant.
 - (c) The magnitude of the potential difference across the resistor increases if $R > C$, but decreases if $R < C$.
 - (d) The magnitude of the potential difference across the resistor decreases if $R > C$, but increases if $R < C$.
 - (e) The magnitude of the potential difference across the resistor increases.

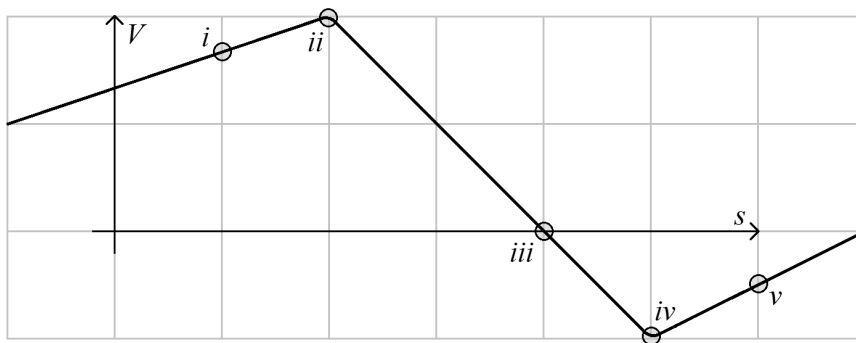
3. (6 points) The two conducting metal spheres pictured below have unequal radii, with $r_1 = 2r_2$, and are connected by a very thin wire. A charge Q_0 is initially placed on sphere 1. The switch in the wire is then closed, allowing charge to move back and forth freely. What will be the charge ratio Q_2/Q_1 when equilibrium is reached? Assume that the two spheres are separated by a very large distance.

- (a) $Q_2/Q_1 = 4$
- (b) $Q_2/Q_1 = 1/4$
- (c) $Q_2/Q_1 = 1$
- (d) $Q_2/Q_1 = 2$
- (e) $Q_2/Q_1 = 1/2$



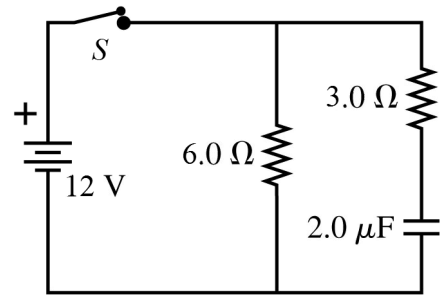
4. (6 points) The electric potential V is shown as a function of position s in a region of space. At which of the indicated locations is the magnitude of the electric field greatest?

- (a) location *ii*
- (b) location *iv*
- (c) location *iii*
- (d) location *v*
- (e) location *i*



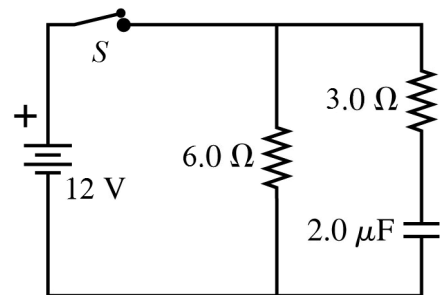
5. (6 points) The switch S has been closed for a long time. What current is supplied by the battery?

- (a) 2.0 A
- (b) 3.0 A
- (c) 4.0 A
- (d) 1.0 A
- (e) 6.0 A



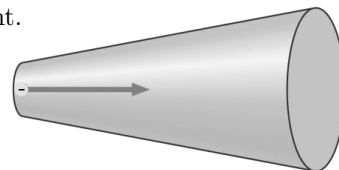
6. (6 points) The switch S has been open for a long time. Immediately upon closing it, what current is supplied by the battery?

- (a) 3.0 A
- (b) 4.0 A
- (c) 1.0 A
- (d) 6.0 A
- (e) 2.0 A



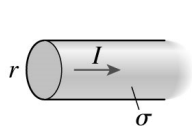
-
7. (6 points) Electrons move from left to right through the frustum of wire. Compare the electric field magnitudes and electron drift speeds at the right and left ends of the wire.

- (a) Field magnitude is greater on the left. Drift speed is greater on the right.
- (b) Field magnitude is greater on the right. Drift speed is greater on the left.
- (c) Field magnitude is greater on the left. Drift speed is greater on the left.
- (d) Field magnitude is the same at both ends. Drift speed is the same at both ends.
- (e) Field magnitude is greater on the right. Drift speed is greater on the right.

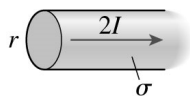


-
8. (6 points) Rank the current density magnitudes in these wires, from greatest to least.

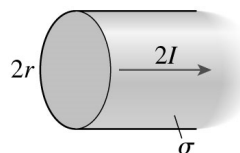
- (a) $ii > i = iv > iii$
- (b) $ii > i = iii = iv$
- (c) $ii > i > iii > iv$
- (d) $ii = iv > i > iii$
- (e) $ii > i > iv > iii$



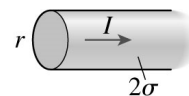
(i)



(ii)



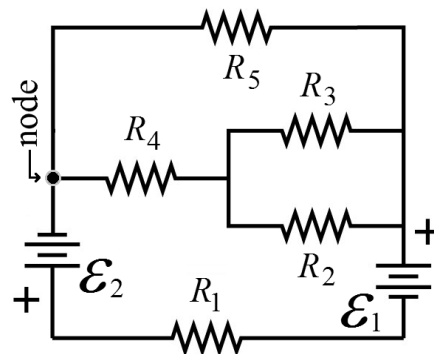
(iii)



(iv)

9. (6 points) Let the currents I_1 – I_5 through the resistors R_1 – R_5 , respectively, be positive when flowing to the right in the circuit shown. Which is a valid expression of Kirchhoff's Node or Junction Law at the indicated node, just to the left of R_4 ?

- (a) $+I_4 - I_5 = 0$
- (b) $-I_1 - I_4 - I_5 = 0$
- (c) $+I_1 - I_2 - I_3 + I_4 + I_5 = 0$
- (d) $-I_4 - I_5 = 0$
- (e) $-I_1 - I_2 - I_3 - I_4 - I_5 = 0$



10. (6 points) Let the currents I_1 – I_5 through the resistors R_1 – R_5 , respectively, be positive when flowing to the right in the circuit shown. Which is a valid expression of Kirchhoff's Loop Law?

- (a) $+\mathcal{E}_1 - I_2R_2 - I_4R_4 + I_5R_5 = 0$
- (b) $+\mathcal{E}_1 + \mathcal{E}_2 + I_1R_1 + I_2R_2 + I_3R_3 + I_4R_4 + I_5R_5 = 0$
- (c) $+\mathcal{E}_1 + I_2R_2 - I_3R_3 + I_5R_5 + \mathcal{E}_2 - I_1R_1 = 0$
- (d) $+\mathcal{E}_1 + I_2R_2 - I_3R_3 + I_4R_4 + I_5R_5 + \mathcal{E}_2 - I_1R_1 = 0$
- (e) $+\mathcal{E}_1 - I_2R_2 - I_3R_3 - I_5R_5 + \mathcal{E}_2 - I_1R_1 = 0$

