Instructor(s): *Z. Qiu*

PHYSICS DEPARTMENT

PHY2005, Spring, 2011 EXAM I January 28, 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	
$\varepsilon_o = 8.85 \times 10^{-12}$ C^2/Nm^2, $\mu_o = 4\pi \times 10^{-7}$ N/A^2	

* All the resistor values are in Ohm.

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1. Two small identical metal spheres carry charges of -2.4 μC and 4.8 μC and are 5.0 m apart. Now the spheres are touched together and again separated to 5.0 m. What force does one exert on the other? (in N)

   (1) 5.18×10^{-4} (2) 1.10×10^{-3} (3) 3.79×10^{-3} (4) 2.03×10^{-4} (5) 7.38×10^{-3}

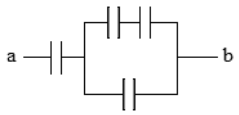
2. Two point charges are on the *x-axis*. A 8.0 μC charge is at $x = -1$ m and a -2.0 μC charge is at $x = 3$ m. Where can a third charge be placed so that the net force on it is zero? (in m)

   (1) $x = 7$ (2) $x = 2$ (3) $x = -8$ (4) $x = 0$ (5) $x = 10$

3. A uniform electric field, with a magnitude of 1800 N/C, is directed parallel to the positive x-axis. If an electron is released from rest at x = 4.0 m, what is its speed as the electron reaches $x = 0$? (in m/s)

   (1) 5.03×10^7 (2) 1.37×10^7 (3) 3.12×10^7 (4) 8.36×10^6 (5) 7.45×10^6

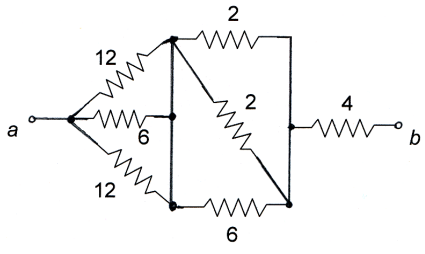
4. What is the equivalent capacitance between points a and b (in μF)? All capacitors are $4.0\mu F$.



   (1) 2.4 (2) 16 (3) 1.0 (4) 6.8 (5) 13.3

5. Reduce the resistors between a and b to a single equivalent resistor. (in Ω)

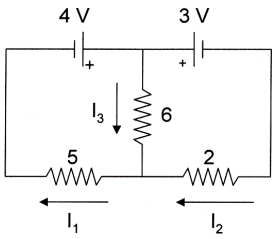
   (1) 7.86
   (2) 14.0
   (3) 9.72
   (4) 11.2
   (5) 18.7



6. Number 10 copper wire (radius = 1.3 mm) is commonly used for electrical installations in homes. What is the voltage drop in 120 m of number 10 copper wire if it carries a current of 5 A? (in V) (The resistivity of copper is $1.7 \times 10^{-8} \Omega \cdot$m.)

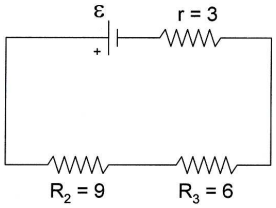
   (1) 1.9 (2) 0.75 (3) 1.2 (4) 0.24 (5) 9.7

7. Using Kirchoff's rules for junctions and loops, the following equations are set to solve the circuit shown in the figure. Choose one equation which describes the circuit *incorrectly*.



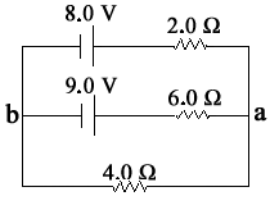
   (1) $3 + 2I_2 + 6I_3 = 0$
   (2) $4 - 6I_3 - 5I_1 = 0$
   (3) $I_1 = I_2 + I_3$
   (4) $1 - 2I_2 - 5I_1 = 0$
   (5) $-3 - 2I_2 + 6I_3 = 0$

8. It takes 4 seconds for R_2 to produce 400 joules of heat. What is the value of ε? (in V)



   (1) 60
   (2) 48
   (3) 72
   (4) 12
   (5) 36

9. Find the current through the 2Ω resistor. (in A)



   (1) 1.0
   (2) 0.5
   (3) 1.5
   (4) 2.0
   (5) 2.5

10. What is the maximum number of 60-W light bulbs you can connect in parallel in a 120-V home circuit without tripping the 45-A circuit breaker?

    (1) 89 (2) 49 (3) 134 (4) 361 (5) 126