Instructor(s): *Z. Qiu*

PHYSICS DEPARTMENT

PHY2005, Spring 2015 EXAM I January 30, 2015

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.

1. Two small identical metal spheres carry charges of -4.1 μC and 8.5 μC and are 5.66 m apart. Now the spheres are touched together and again separated to 5.66 m. What force does one exert on the other? (in N)

(1) 1.36×10^{-3} (2) 3.34×10^{-3} (3) 15.67×10^{-3} (4) 6.07×10^{-4} (5) 10.38×10^{-2}

2. Two point charges are on the *x-axis*. A 3.6 μC charge is at $x = 0$ m and a -0.4 μC charge is at $x = 6$ m. Where can a third charge be placed so that the net force on it is zero? (in m)

(1) $x = 9$ (2) $x = 2$ (3) $x = -5$ (4) $x = 4$ (5) $x = 12$

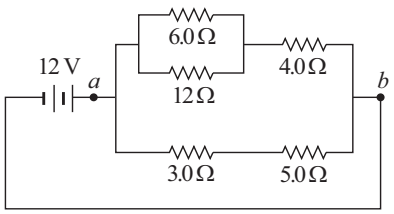
3. A uniform electric field, with a magnitude of 1625 N/C, is directed parallel to the positive x-axis. If a proton is released from rest at x = - 4.0 m, what is its kinectic energy as the proton reaches $x = 4m$? (in joules)

(1) 2.08×10^{-15} (2) 9.6×10^{-16} (3) 1300 (4) 0 (5) 3.84×10^{-14}

4. Two charges are placed on the x axis. One is 2.0 μ C at $x = -1$ m. The other is 3.0 μC at $x = 2.0$ m. What is the electric field at the point $x = 0$ due to these charges? (in N/C)

(1) 1.13×10^2 (2) 3.34×10^2 (3) 15.67×10^2 (4) 6.07×10^4 (5) 10.38×10^2

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



(1) 4.0
(2) 8.0
(3) 12.0
(4) 5.2
(5) 10.5

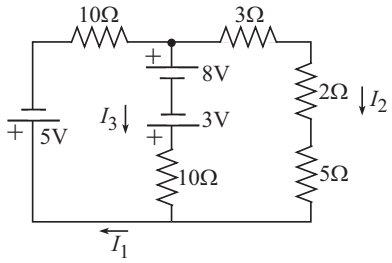
6. In the previous problem, the current in the 5.0-Ω resistor in the circuit shown is:

(1) 1.5 A (2) 0.5 A (3) 3.5 A (4) 0.8 A (5) 1.0 A

7. A certain wire has resistance 8Ω. Another wire, of the same material, has three times the length and twice the diameter of the first wire. The resistance of the second wire is (in Ω):

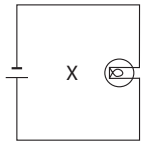
(1) 6 (2) 3 (3) 1.5 (4) 0.75 (5) 12

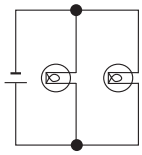
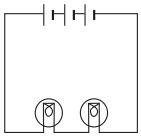
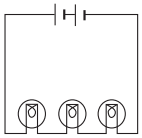
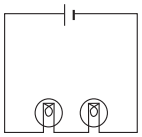
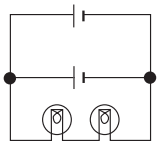
8. Using Kirchoff's rules for junctions and loops, the following equations are set to solve the circuit shown in the figure. Choose one equation which describes the circuit *incorrectly*.



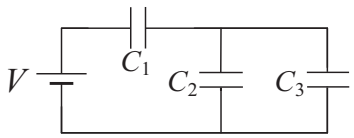
(1) $5 + 2I_2 + 6I_3 = 0$
(2) $5 + 10I_1 + 10I_2 = 0$
(3) $I_1 = I_2 + I_3$
(4) $10 + 10I_1 + 10I_3 = 0$
(5) $5 - 10I_2 + 10I_3 = 0$

9. In the diagrams, all light bulbs are identical and all emf devices are identical. In which circuit will each of the bulbs glow with the same brightness as in circuit X?



(1) 
(2) 
(3) 
(4) 
(5) 

10. A 20 V battery is connected across capacitors of capacitances $C_1 = 4\mu$F, $C_2 = 10\mu$F and $C_3 = 6\mu$F as in the figure. Find the charge on capacitor C_3 in μC.



(1) 24 (2) 60 (3) 80 (4) 36 (5) 48

THE FOLLOWING QUESTIONS, NUMBERED IN THE ORDER OF THEIR APPEARANCE ON THE ABOVE LIST, HAVE BEEN FLAGGED AS CONTINUATION QUESTIONS: 6