

Instructor(s): *P. Hirschfeld*PHYSICS DEPARTMENT  
EXAM I

February 8, 2017

PHY 2005, Spring 2017

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:**

$g = 9.8 \text{ m/s}^2$	$m_e = 9.11 \times 10^{-31} \text{ Kg}$
$m_p = 1.67 \times 10^{-27} \text{ Kg}$	$e = 1.6 \times 10^{-19} \text{ C}$
constant $k$ in Coulomb's Law: $k = 9 \times 10^9 \text{ Nm}^2/\text{C}^2$	
$\mu_o = 4\pi \times 10^{-7} \text{ N/A}^2$	$\epsilon_o = 8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$

1. Two point charges are on the  $x$ -axis. A  $+4.0 \mu\text{C}$  charge is at  $x = -1 \text{ m}$  and a  $+1 \mu\text{C}$  is at  $x = 2 \text{ m}$ . A third charge is placed between two charges so that the net force on it is zero. What is the coordinate of the third charge? (in m)

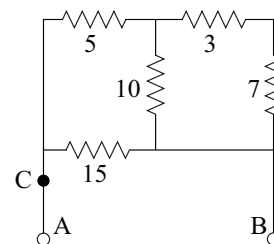
- (1)  $x = 1$                       (2)  $x = 5$                       (3)  $x = -0.5$                       (4) nowhere on the  $x$ -axis                      (5)  $x = 0.5$

2. A 6-A current is maintained in a simple circuit with a total resistance of  $200 \Omega$ . What net charge passes through any point in the circuit during a 1-minute interval? (in C)

- (1) 360                      (2) 1200                      (3) 60000                      (4) 12000                      (5) 157

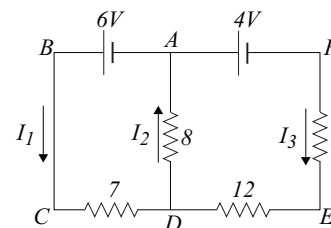
3. A 9 V battery is connected across the ports A and B. How much current is flowing through the point C in the figure? (in Amps)

- (1) 1.5  
(2) 0.6  
(3) 0.67  
(4) 1.67  
(5) 16.0

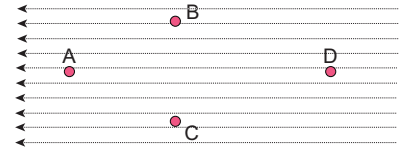


4. Which is the correct loop equation for loop ABCDEFA in the circuit shown in the figure?

- (1)  $7I_1 - 15I_3 = 10$   
(2)  $7I_2 + 10I_3 = 6$   
(3)  $-7I_1 + 9I_3 = 2$   
(4)  $7I_1 - 12I_2 - 3I_3 = 4$   
(5)  $I_1 + I_3 = I_2$

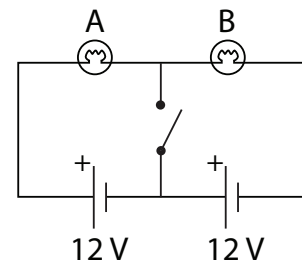


5. A  $-3\text{ mC}$  charge is placed in a uniform electric field at one of 4 possible positions A,B,C,D. Which of the following statements is **wrong**?

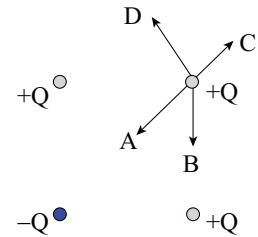


- (1) If the charge is released at D, it will move to the left.
  - (2) The electric potential at C is higher than at A.
  - (3) The electric potential energy at B is the same as at C.
  - (4) When the charge is moved from A to D, the electric potential energy decreases.
  - (5) At all positions, the charge feels a force to the right.
6. Two charges are separated by a distance  $r = 5\text{ m}$ . The magnitude of the force between these two charges is  $F = 4\text{ N}$ . Then the charges are moved until the magnitude of  $F$  is  $100\text{ N}$ . Now, how far apart are the charges?
- (1) 1 m                      (2) 0.2 m                      (3) 1.25 m                      (4) 0.25 m                      (5) 0.5 m
7. Two parallel resistors are arranged in a circuit with a battery. In this circuit,  $R_a = 2\ \Omega$  and  $R_b = 4\ \Omega$ . The current flowing through  $R_a$  is  $i_a = 8\text{ A}$ . How much current is flowing through  $R_b$ ?
- (1) 4 A                      (2) 8 A                      (3) 3 A                      (4) 6 A                      (5) 5 A

8. The light bulbs in the circuit are identical (same resistance). When switch is closed, which of the following statements describes the situation correctly?



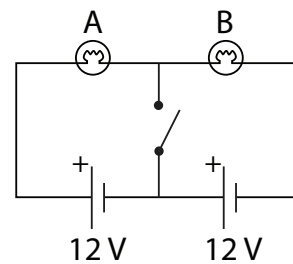
- (1) Nothing changes.
  - (2) The intensity of bulb A decreases.
  - (3) The intensity of bulb B decreases.
  - (4) The intensity of bulb A or B increases.
  - (5) —
9. There are four charges arranged at the corner of a square as shown in the figure. Which of the vectors represents the net force acting on the charge correctly?
- (1) C  
(2) A  
(3) B  
(4) D  
(5) not enough information.



10. Two small identical metal spheres carry charges of  $+1.3\ \mu\text{C}$  and  $-0.5\ \mu\text{C}$  and are  $5.0\text{ m}$  apart. Now the spheres are touched together and again separated to  $5.0\text{ m}$ . What force does one exert on the other? (in N)
- (1) repulsive  $5.75 \times 10^{-5}$   
(2) attractive  $2.34 \times 10^{-4}$   
(3) repulsive  $2.86 \times 10^{-4}$   
(4) attractive  $8.25 \times 10^{-4}$   
(5) attractive  $1.24 \times 10^{-5}$

11. Two identical light bulbs (A and B) are connected as shown in the figure. Each light bulb produces 14.4 W of power. What is the resistance of the bulb? (in  $\Omega$ )

- (1) 10  
(2) 14.4  
(3) 57.6  
(4) 1.2  
(5) 144



12. The electric field in a certain region is 500 N/C, directed straight downward. A 8-g ball hangs from a thread in this region. Find the tension in the thread if the charge on the ball is  $-15\mu\text{C}$  (in N).

- (1)  $7.09 \times 10^{-2}$       (2)  $8.59 \times 10^{-3}$       (3)  $8.59 \times 10^{-2}$       (4) 7.09      (5) 85.90