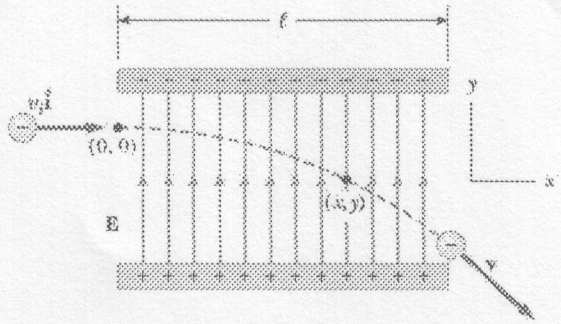
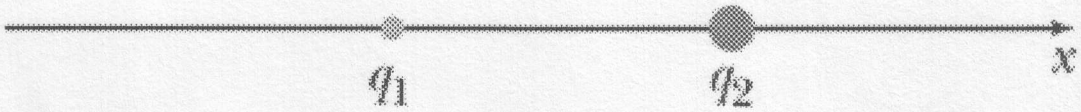
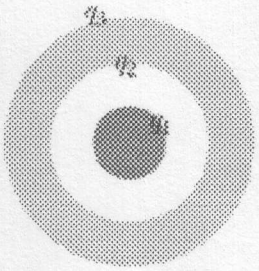
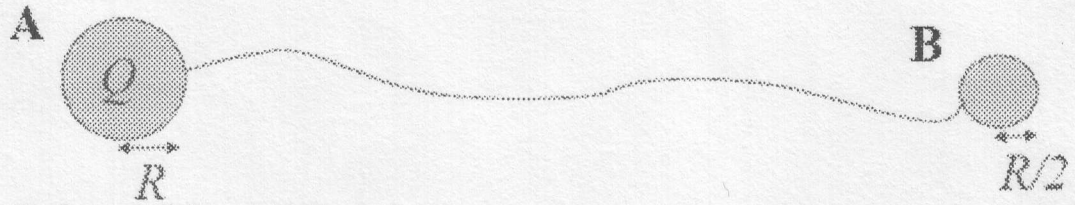
Exam 1 on October05. 2007 - Physics 106 – R. Schad

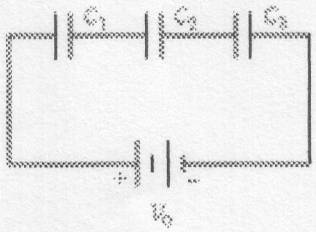
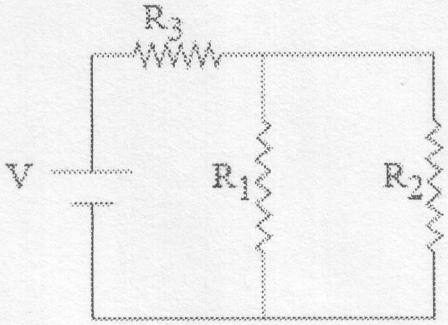
YOUR NAME	STUDENT NUMBER
solution	

(A) ✓

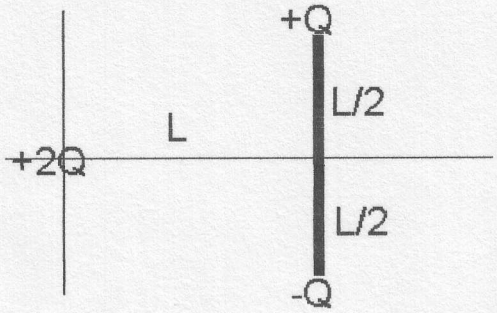
1.	**This is to identify the exam version you have – IMPORTANT** **Mark the A as answer for number 1**
2.	**This is to identify the exam version you have – IMPORTANT** **Mark the B as answer for number 2**
3. B	 ©2004 Thomson - Brooks/Cole While the charge flies through that field … What can we tell about v_x? a) v_x will increase b) v_x will stay constant c) v_x will decrease
4. C	(same picture) What can we tell about v_y? a) v_y will become more positive b) v_y will stay constant c) v_y will become more negative
5. B	(same picture) What can we tell about the acceleration? [magnitude only] a) The acceleration will increase b) The acceleration will stay constant c) The acceleration will decrease

6. 17	Two point charges, $q_1 = +q$ and $q_2 = -2q$, are fixed at positions on the x-axis, as shown below. If you were to place a third (positive) point charge somewhere so that the force on it would be zero, you should place that charge at which location? A) on the x-axis to the left of the two charges B) off of the x-axis C) on the x-axis to the right of the two charges D) on the x-axis in between the two charges 
7. B	A **conducting** spherical shell (below) is concentric with a solid **conducting** sphere. Initially, each conductor carries zero net charge. **A charge of +2Q is placed on the inner surface of the spherical shell.** After equilibrium is achieved, the charges on the surface of the solid sphere, q_1, the inner surface of the spherical shell, q_2, and the outer surface of the spherical shell, q_3, are which of the following? A) $q_1 = -Q$, $q_1 = +Q$, $q_1 = +Q$ B) $q_1 = 0$, $q_2 = 0$, $q_3 = +2Q$ C) $q_1 = 0$, $q_2 = +2Q$, $q_3 = 0$ D) $q_1 = +Q$, $q_2 = -Q$, $q_3 = +3Q$ 

8. B	The electric potential is monotonously increasing along the $+x$ axis. From this we can conclude that the x component of the electric field is which of the following? a) E is constant and points in the +x-direction b) E is constant and points in the -x-direction c) E is monotonously increasing and points in the +x-direction d) E is monotonously increasing and points in the +x-direction e) zero
9. 4.	A is a solid conducting sphere of radius R has an excess charge Q. The electrical potential at the surface of the sphere is: $V = \dfrac{Q}{4\pi\varepsilon_0 R}$ [but be very careful when attempting to use this equation !] A second uncharged conducting sphere **B** of radius R/2 is brought to a distance >> R from the first sphere. The two spheres are connected by a fine conducting wire. What can you say about the electrical potential of each of the two spheres now they are connected?  1. Both potentials ar e zero. 2. Potential of A is twice the potential of B. 3. Potential of A is half the potential of B. 4. Potential of A is equal to the potential of B. 5. None of the above
10. C	What maximum power can be generated from an 18 V battery using any combination of one 6.0-Ω resistor and one 9.0-Ω resistor? **a.** 54 W **b.** 71 W **c.** 90 W **d.** 80 W **e.** 22 W

11. D	Charges $q = -40$ pC and $Q = +30$ pC are placed on the x axis at $x = 0$ and $x = 2.0$ m, respectively. [the 'p' in pC stands for 10^{-12}] Determine the net flux through a spherical surface (radius = 1.0 m) centered on the origin. **a.** $-9.6\ \mathrm{N \cdot m^2/C}$ **b.** $-6.8\ \mathrm{N \cdot m^2/C}$ **c.** $-8.5\ \mathrm{N \cdot m^2/C}$ **d.** $-4.5\ \mathrm{N \cdot m^2/C}$ **e.** $-1.1\ \mathrm{N \cdot m^2/C}$
12. C,	Determine the energy stored in C_1 when $C_1 = 10\ \mu\mathrm{F}$, $C_2 = 12\ \mu\mathrm{F}$, $C_3 = 15\ \mu\mathrm{F}$, and $V_0 = 70$ V.  **a.** 6.5 mJ **b.** 5.1 mJ **c.** 3.9 mJ **d.** 8.0 mJ **e.** 9.8 mJ
13. E	A battery supplying 40V is connected to the circuit shown in which R1 = 12Ω, R2 = 4Ω, and R3 = 7Ω. What is the rate of joule heating (power) in the resister R1? A) 3.33 W B) 4 W C) 10 W D) 11.5 W E) 12 W 

14. A rigid rod of length L has a charge +Q at the top end and a charge -Q at the bottom end.
The center of the rod lies on the x axis a distance L from the origin.
Q = 1C; L = 1m
The rod is parallel to the y axis.
The force on a charge +2 Q situated at the origin due to the rod is:
First, do complete the drawing of this and think!
[expressed as (x-component of F , y-component of F)



A) (0 , 1.79 k_e)

B) (1.28 k_e , 0)

C) (0 , -1.43 k_e)

D) (1.41 k_e , 0.707 k_e)

E) (0.125 k_e , 0)