

Name (signature as on ID) _____ Lab Section _____

Midterm 1 Exam Chaps. 17–19 in Young&Geller 8e

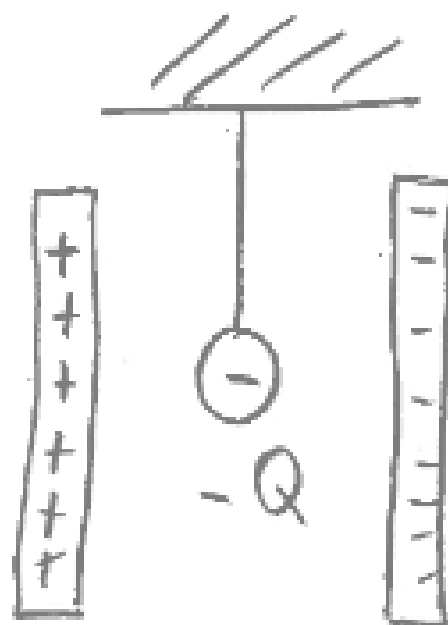
Multiple choice questions. Circle the correct answer. No work need be shown and no partial credit will be given.

(5 pts) 1. Two equally charged spheres of mass 1.0g are placed 2.0cm apart. When released, they begin to accelerate at $643m/s^2$. What is the magnitude of the charge on each sphere?

- (a) 170 nN
- (b) 140nN
- (c) 120nN
- (d) 94nC

(5 pts) 2. A very small ball containing a charge $-Q$ hangs from a light string between two vertical plates, as shown in the figure. When released from rest the ball will

- (a) swing to the right
- (b) swing to the left
- (c) remain hanging vertically
- (d) need more information



(5 pts) 3. When a certain capacitor carries charge of magnitude Q on each plate, it stores energy U . In order to store twice as much energy, how much charge should there be on its plates?

- (a) $\sqrt{2}Q$
- (b) $2Q$
- (c) $4Q$
- (d) $8Q$

(5 pts) 4. A proton with a speed of $5.0 \times 10^5 \text{ m/s}$ falls through a potential difference V and thereby increases its speed to $8.0 \times 10^5 \text{ m/s}$. Through what potential difference did the proton fall?

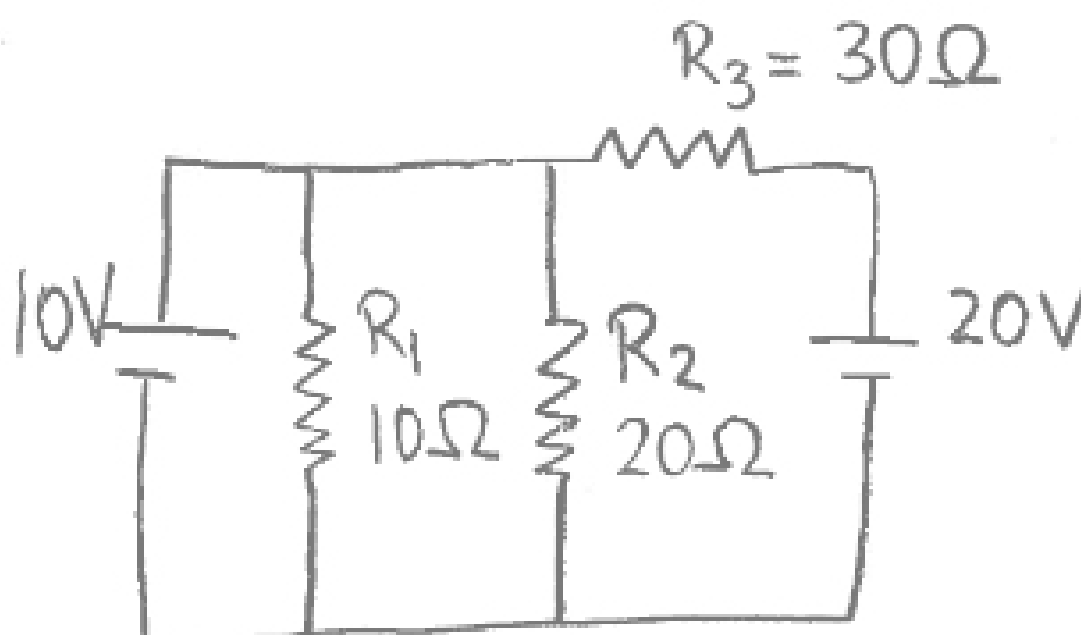
- (a) 2000 V
- (b) 1300 V
- (c) 3300 V
- (c) 4600 V
- (e) 660 V

(5 pts) 5. Two metal rods are welded together end to end. If each rod has a length L and a resistivity ρ , the resistivity of the combination will be

- (a) 4ρ
- (b) 2ρ
- (c) ρ
- (d) $\rho/2$

(5 pts) 6. What is the current through R_1 in the circuit shown in the figure below?

- (a) 1.00 A
- (b) 0.67 A
- (c) 0.0 A
- (d) 9.80 A



On the following problems show all your work. Partial credit will be given if earned.

(10 pts) 7. In redesigning a parallel-plate capacitor with circular plates, you triple both the diameter of the plates and their separation. If the original capacitor has capacitance C_0 , what is the capacitance of the redesigned capacitor in terms of C_0 ?

(10 pts) 8. If you triple the length of a cable and at the same time double its diameter, what will be the resistance if its original resistance was R ?

(20 pts) 9. Two large metal plates carry opposite charges of equal magnitude. They are separated by 45.0mm and the potential difference between them is 360V.

(a) What is the magnitude of the uniform electric field in the region between the plates?
(10pts)

(b) What is the magnitude of the force this field exerts on a particle of charge $+2.40nC$?
(10pts)

(30 pts) 10. Two point charges are separated by 25.0cm as indicated in the figure below. Find the net electric field these charges produce at

(a) point A (10pts)

(b) point B (10pts)

(c) What would be the magnitude and direction of the electric force this combination of charges would produce on a proton at A? (10pts)

