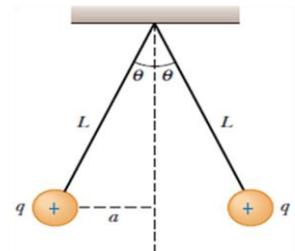




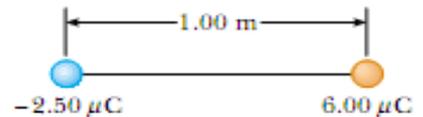
**Question 1:** (8/60)

Two identical small charged spheres, each having a mass of  $3.0 \times 10^{-2}$  kg, Hang in equilibrium as shown in Figure.  
 The length of each string is 0.15 m, and the angle  $\theta = 5.0^\circ$ .  
 1- Draw free body diagram (force diagram) of left charge.  
 2- Find the magnitude of the charge on each sphere.



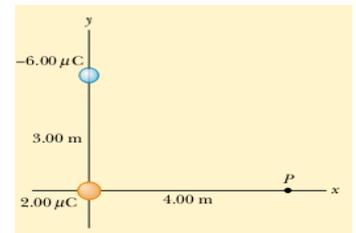
**Question 2:** (5/60)

Determine the point other than infinity at which the total electric field is zero.



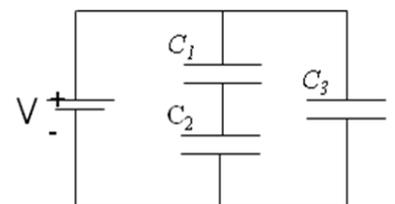
**Question 3:** (7/60)

- A charge  $q_1 = 2.00 \mu C$  is located at the origin, and a charge  $q_2 = 6.00 \mu C$  is located at (0,3) m,  
 (A) Find the total electric potential due to these charges at the point P, whose coordinates are (4,0)m.  
 (B) You bring a third charge  $q_3 = 3.00 \mu C$  from infinity to point P (4,0)m, How much work must you do?  
 (C) Find the total potential energy of the system of all 3 charges.



**Question 4:** (8/60)

- A In the following circuit:  $C_1 = 10 \mu F$ ,  $C_2 = 5.0 \mu F$ ,  $C_3 = 4.0 \mu F$ .  
 A) Find the equivalent capacitance of the whole combination.  
 B) If  $V = 100$  volts, what is the charge  $Q_3$  on  $C_3$ ?  
 C) What is the total energy stored in the circuit?



**Question 5:** (6/60)

Calculate the cost of using a machine for 4 h, if it operates continuously at 20A and 240V.  
 Assume the cost of energy is 0.080 \$/kWh.



**Question 6:** **(10/60)**

A battery has an electromotive force (*emf*) of 12.0 V and an internal resistance of 0.05 Ω. Its terminals are connected to a load resistance of 3.00 Ω.

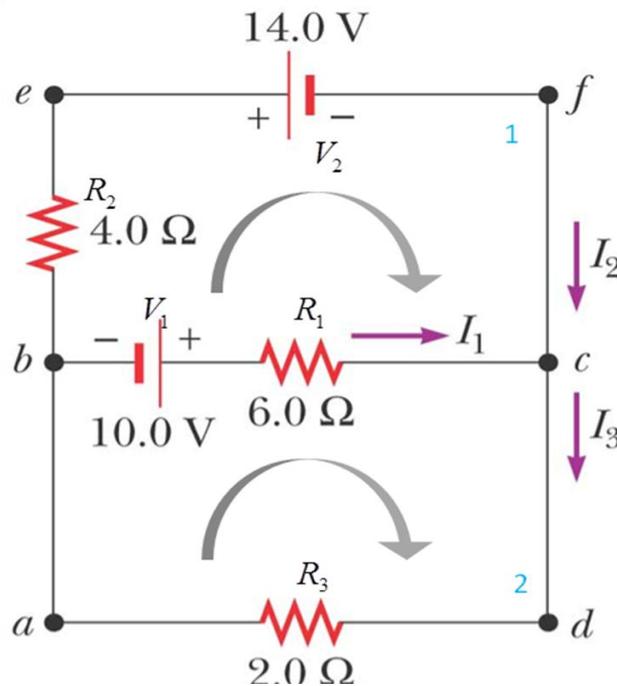
- (a) Find the current in the circuit.
- (b) Find the terminal voltage of the battery.
- (c) Calculate the power delivered to the load resistor.
- (d) Calculate the power delivered to the internal resistance of the battery.
- (E) Calculate the power delivered by the battery.

**Question 7:** **(6/60)**

The current in a loop circuit that has a resistance of R1 is 2A. The current is reduced to 1.6A when an additional resistor R2=3Ω is added in series with R1. What is the value of R1?

**Question 8:** **(10/60)**

Find all three currents:  $I_1, I_2, I_3$ .



Note :  $k = 9 \times 10^9$ ,

End of Questions