PHYS 212 Spring 2011 Test #3 Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

$V=\frac{kq}{r}$ P = iv = v2/R = i2R Ohm’s law: v = iR $A\_{circle}$= π$r^{2}$ $R=ρ\frac{L}{A}$

1. In the figure charges are located along the perimeter of a rectangle



of sides a and 2a. What is the electric potential at the center of the
rectangle? (a = 10 cm, q1 = 3 µC, and q2 = 5 µC)

2. A 240 W incandescent light bulb is plugged into a standard 120 V outlet. Assume electrical energy costs US$ 0.08/kW · h. **(a)** How much does it cost in dollars per 31-day month to leave the light turned on 1 hour per day?  **(b)** What is the resistance of the bulb?
**(c)** What is the current in the bulb?

3. Suppose a kite string of radius 2.00 mm extends directly upward by 0.800 km and is coated with a 0.500 mm layer of water having resistivity 150 *Ω*.m. If the potential difference between the two ends of the string is 160 MV, what is the current through the water layer?

Capacitor Charge:  Stored energy:  $C=\frac{Kϵ\_{0}A}{d}$

  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4.   In the Figure, the battery has a potential difference of *V* = 10.0 V and the five capacitors each have a capacitance of 10.0 *μ*F. What is the charge on (a) capacitor 1 and (b) capacitor 2?



|  |  |
| --- | --- |
|  |  |
|

5. Figure below shows a parallel-plate capacitor of plate area *A* = 10.5 cm2 and plate separation 2*d* = 7.12 mm. The left half of the gap is filled with material of dielectric constant *κ*1 = 21.0; the top of the right half is filled with material of dielectric constant *κ*2 = 42.0; the bottom of the right half is filled with material of dielectric constant *κ*3 = 58.0. What is the capacitance? $(ε\_{0}=8.85×10^{-12} C^{2}/(N.m^{2})$



|  |
| --- |
|  |

|  |  |
| --- | --- |
|  |  |
|  |  |

6. The figure here shows a portion of a circuit. What is the current *i* in the lower right-hand wire? (Include the direction)





7. What is the electric field in unit vector notation at the point (3**i** – 6**j** +**k**) m if the electric potential is given by *V* = 3*x3yz*, where *V* is in volts and *x*, *y*, and *z* are in meters?