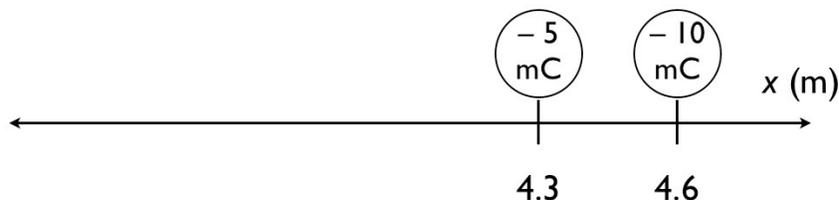


Closed book. No work needs to be shown for multiple-choice questions.

1. A charge of -5.0 mC is rigidly held on the x -axis at $x = 4.3$ m. Find the work done bringing a -10.0 mC particle in from infinity to $x = 4.6$ m.

- a) 9.7×10^4 J.
 b) 7.5×10^5 J.
 c) 1.5×10^6 J.
 d) 3.0×10^6 J.
 e) 3.0×10^8 J.



2. A 6.0 μF capacitor holds a charge of 3.0 C on each of its plates. A second capacitor of 12.0 μF also holds a charge of 3.0 C on each of its plates. Which of the following is true?

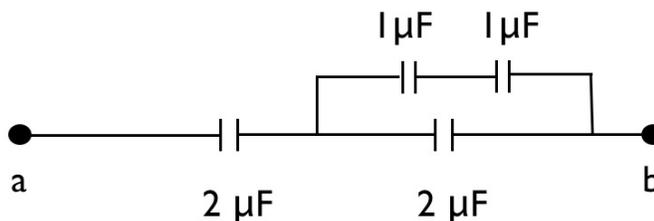
- a) The 6.0 μF capacitor stores four times as much energy as the 12.0 μF capacitor.
 b) The 6.0 μF capacitor stores twice as much energy as the 12.0 μF capacitor.
 c) The 6.0 μF capacitor stores the same amount of energy as the 12.0 μF capacitor.
 d) The 6.0 μF capacitor stores half as much energy as the 12.0 μF capacitor.
 e) The 6.0 μF capacitor stores a quarter as much energy as the 12.0 μF capacitor.

3. Two flat metal circles of radius $r = 15$ mm are brought a distance $d = 8.0$ mm apart to form a parallel plate capacitor. The surface charge density, σ , of one plate is measured to be $+1.0 \times 10^{-3}$ μC per square mm (*i.e.* charge/area = $+1.0 \times 10^{-3}$ $\mu\text{C}/\text{mm}^2$). The potential difference across the capacitor is measured to be 0.12 Volts. It is not known if there is material between the plates. Which of the following is **true**?

- a) There is a dielectric between the plates with dielectric constant 0.75
 b) There is a dielectric between the plates with dielectric constant 75
 c) There is a dielectric between the plates with dielectric constant 7.5
 d) There is a dielectric between the plates with dielectric constant 750
 e) There is a dielectric between the plates with dielectric constant 7500

4. Four capacitors are connected as shown below. What is the equivalent capacitance between points **a** and **b**?

- a) $3/4$ μF .
 b) 6 μF .
 c) $4/3$ μF .
 d) 3 μF .
 e) $10/9$ μF .

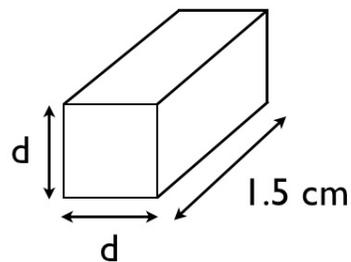


5. Two light bulbs are connected in parallel to a 10.0V battery. In this circuit, one bulb dissipates 100.0 W while the other dissipates 150.0 W. After 2.0 hours, which of the following is **true**?

- a) The 100.0 W bulb has used 200 kWh.
- b) The 100.0 W bulb has used 100 kWh.
- c) The 100.0 W bulb has used 0.50 kWh.
- d) The 100.0 W bulb has used 0.20 kWh.
- e) The 100.0 W bulb has used 0.10 kWh.

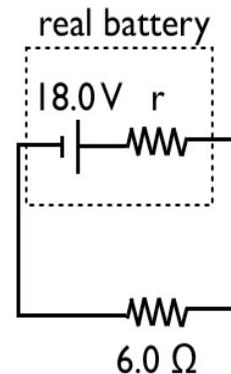
6. A $200.0\ \Omega$ resistor is constructed by forming a material of resistivity $2.5\ \Omega\cdot\text{m}$. The cross-section of this resistor is shaped like a square with side length d . The resistor is 1.5 cm long. What is the value of the side length d ?

- a. 0.19 mm.
- b. 3.0 mm.
- c. 1.4 cm.
- d. 7.3 cm.
- e. 1.2 m.



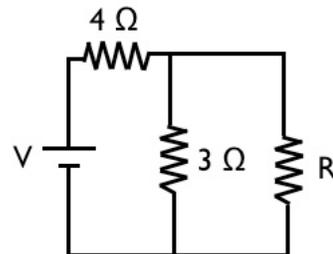
7. A real battery marked 18.0 V is attached to a $6.0\ \Omega$ resistor. The current is then measured to be 2.5 A. What is the internal resistance of the real battery?

- a. $0.33\ \Omega$.
- b. $1.2\ \Omega$.
- c. $3.0\ \Omega$.
- d. $7.2\ \Omega$.
- e. $0\ \Omega$.



8. In the picture below, a current of 5.0 A goes through the resistor labeled R and a current of 1.0 A goes through the $3.0\ \Omega$ resistor. What is the current through the $4.0\ \Omega$ resistor?

- a) 1.0 A.
- b) 3.0 A.
- c) 4.0 A.
- d) 5.0 A.
- e) 6.0 A.



9. Two $10\ \Omega$ resistors are in parallel in a circuit. What is the equivalent resistance of the two?

- a) $20\ \Omega$
- b) $10\ \Omega$
- c) $5\ \Omega$
- d) $40\ \Omega$
- e) $2.5\ \Omega$

10. Two $10\ \Omega$ resistors are in series in a circuit. What is the equivalent resistance of the two?

- a) $20\ \Omega$
- b) $10\ \Omega$
- c) $5\ \Omega$
- d) $40\ \Omega$
- e) $2.5\ \Omega$