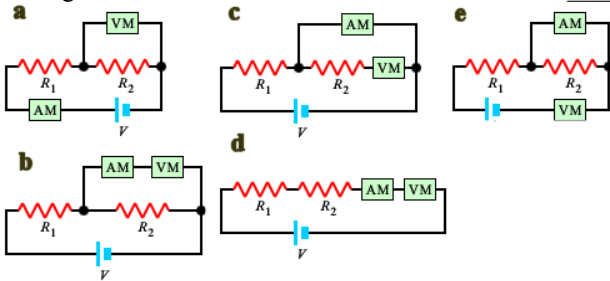


Instructions:

1. Do all of your work on this sheet.
2. **Show all of your steps** in problems for full credit.
3. **Be clear and neat** in your work. Any illegible work, or scribbling in the margins, will not be graded.
4. Place your **answers in a box**.
5. If you need more space, you may use the back of the page and write **On back** in the problem space.

1. **Multiple Guess (3 pts)** Find the answer which best fits the question and write it in the space provided.

- a. Equipotential lines are lines of
 a) force; b) equal charge; c) constant electric potential;
 d) equal electric fields; e) none of these. _____
- b. Which of the below configurations is the correct way to place the voltmeter and ammeter for measuring the voltage and current across R_2 ? _____



- c. A copper wire has twice the length and twice the cross-sectional area of another copper wire. How do the resistances compare?
 a) The longer wire has twice the resistance.
 b) Both wires have the same resistance.
 c) The longer wire has four times the resistance.
 d) None of the above. _____

2. **Definition/Principle (3 pts)**

a. For the AC voltage $V = 17.0 \sin 157t$ find (with units)

- i. The rms-voltage _____
- ii. The frequency _____

b. Give the *exact expression* for the capacitance for a capacitor with a dielectric constant κ , separation d , and area A .

Constants: $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N}\cdot\text{m}^2$ $m_e = 9.11 \times 10^{-31} \text{ kg}$

Bonus: How much work is done moving a $7.5 \times 10^{-6} \text{ C}$ charge from a point at a potential of $+150.0 \text{ V}$ to a point at a potential of -50.0 V ?

3. **Problems (14 pts)**

- a. A $+2.0 \mu \text{ C}$ charge is placed at $(4.0 \text{ cm}, 0 \text{ cm})$ and a $-2.0 \mu \text{ C}$ charge is placed at the point $(0 \text{ cm}, 2.0 \text{ cm})$. Find the total electric potential at point A.



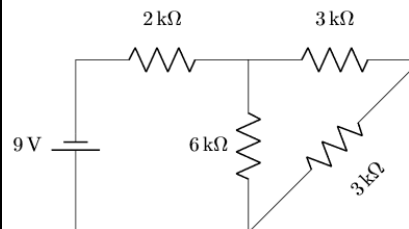
- b. The temperature of a 250.0Ω resistor is increased 125°C . If the thermal coefficient of resistivity is $0.0035 (\text{ }^\circ \text{C})^{-1}$, what is the new resistance?

- c. An electron is released from the negative plate of a parallel plate capacitor. Find the electron's speed at the positive plate if the potential difference across the plates is 12.0 V .

- d. A 12.0 V battery is connected to a 350Ω resistor. What is the power loss across the resistor?

e. For the below circuit

- i. Find the equivalent resistance of the network.



- ii. Find the currents across the $2 \text{ k}\Omega$ and $6 \text{ k}\Omega$ resistors.