

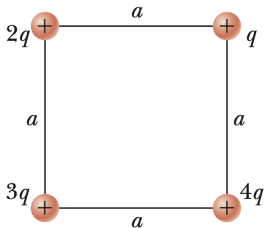


Electricity and Magnetism Review Problems

Mission College

Problem for you - E-field, Force, Potential

- 25.** Four charged particles are at the corners of a square of side a as shown in Figure P23.25. Determine (a) the electric field at the location of charge q and (b) the total electric force exerted on q .



- (c) the electric potential at the location of q (from the other 3 charges) if $V = 0$ at infinity, (d) the work done to bring q in from infinity to the location shown in the diagram.

Problem for you - E-field, Force, Potential

- 45.** A uniformly charged insulating rod of length 14.0 cm is bent into the shape of a semicircle as shown in Figure P23.45. The rod has a total charge of $-7.50 \mu\text{C}$. Find (a) the magnitude and (b) the direction of the electric field at O , the center of the semicircle.



(c) the electric potential at point O .

Problem for you - Electric Potential

- 36.** Figure P25.36 represents a graph of the electric potential in a region of space versus position x , where the electric field is parallel to the x axis. Draw a graph of the x component of the electric field versus x in this region.

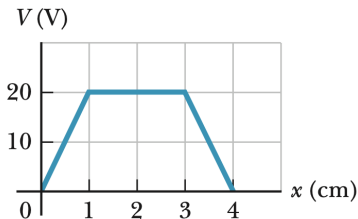
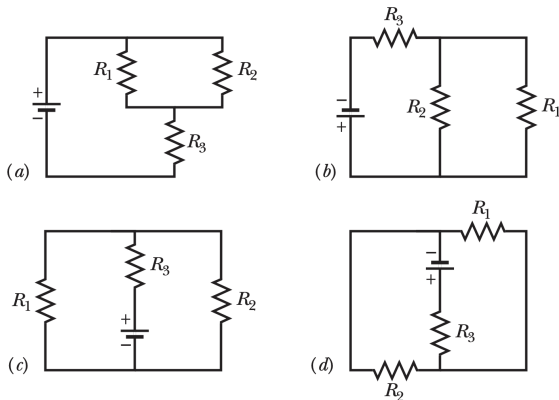


Figure P25.36

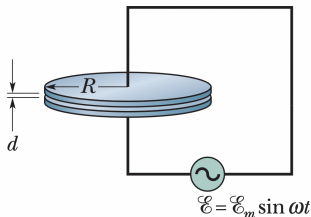
Problem for you - Circuits

If the battery in each circuit shown is ideal and supplies 10 V and $R_1 = 100\ \Omega$, $R_2 = 200\ \Omega$, $R_3 = 300\ \Omega$, what is the power dissipated in resistor R_1 in each circuit?



(Hint: how do these circuits compare to each other?)

Problem for you - Ampère-Maxwell Law



•••29 In Fig. 32-36, a capacitor with circular plates of radius $R = 18.0$ cm

Figure 32-36 Problem 29.

is connected to a source of emf $\mathcal{E} = \mathcal{E}_m \sin \omega t$, where $\mathcal{E}_m = 220$ V and $\omega = 130$ rad/s. The maximum value of the displacement current is $i_d = 7.60 \mu\text{A}$. Neglect fringing of the electric field at the edges of the plates. (a) What is the maximum value of the current i in the circuit? (b) What is the maximum value of $d\Phi_E/dt$, where Φ_E is the electric flux through the region between the plates? (c) What is the separation d between the plates? (d) Find the maximum value of the magnitude of \vec{B} between the plates at a distance $r = 11.0$ cm from the center.

Some answers

E-field, Force, Potential

#25 (a) $\vec{\mathbf{E}} = \frac{kq}{a^2}(3.06\hat{\mathbf{i}} + 5.06\hat{\mathbf{j}})$, (b) $\vec{\mathbf{F}} = \frac{kq^2}{a^2}(3.06\hat{\mathbf{i}} + 5.06\hat{\mathbf{j}})$,
(c) $V = 8.12\frac{kq}{a}$, (d) $W_{\text{app}} = 8.12\frac{kq^2}{a}$

#45 (a) $2.16 \times 10^7 \text{ N/C}$ (b) left

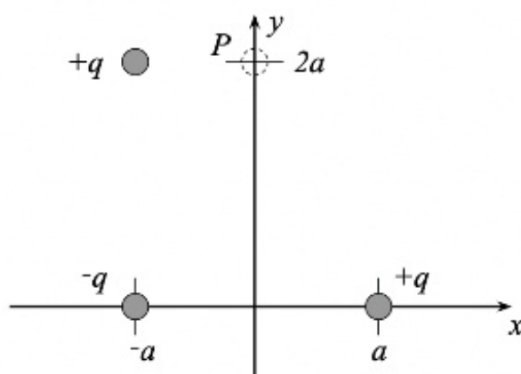
Circuits problem - all the circuits are equivalent!

current thru battery = 27 mA; $\Delta V_{12} = 1.818 \text{ V}$;

$$P_1 = \frac{\Delta V_{12}}{R_1} = 33 \text{ mW}$$

1. [16 pts total] Three charges of the same magnitude $q = 2.00 \times 10^{-12}$ C (but differing signs) are placed as shown, with $a = 3.00$ cm. A third charge of $Q = +7.00 \times 10^{-12}$ C is to be brought from a very long way away up to the point P indicated with the dashed circle.

- (a) What is the electric potential at point P? [4 pts]
- (b) What is the work required to bring the charge Q to point P? [3 pts]
- (c) What is the electric field at point P? [6 pts]
- (d) What is the force on the charge Q when it is at point P? [3 pts]



••15 ILW An oscillating LC circuit consisting of a 1.0 nF capacitor and a 3.0 mH coil has a maximum voltage of 3.0 V. What are (a) the maximum charge on the capacitor, (b) the maximum current through the circuit, and (c) the maximum energy stored in the magnetic field of the coil?