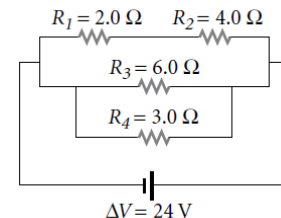


# Honors Physics – Ch 17-18 Practice Problems

- A charged particle moves through a distance of 9.35 m parallel to a uniform electric field. The electrical potential energy of the particle increases by  $3.17 \times 10^{-10}$  J as it moves. The electric field has a magnitude of  $1.25 \times 10^5$  N/C.
  - What is the charge on the particle?
  - What is the potential difference between the starting and final positions?
- Two parallel plates are separated by a distance of 0.077 cm. Between the plates is a uniform electric field having a magnitude of  $6.5 \times 10^2$  N/C. What is the magnitude of the potential difference between the plates?
- A Canadian company has developed a scanning device that can detect drugs, explosives, and even cash that are being smuggled across state borders. A scanner uses accelerated protons to generate gamma rays, which can easily penetrate through most substances that are less than a few centimeters thick. At the heart of the scanner is a compact power supply that can produce an electric potential as large as  $1.0 \times 10^6$  V. Find the value of a point charge  $q$  that would create an electric potential of  $1.0 \times 10^6$  V at a distance of 12 cm.
- A huge capacitor powers the large Nova laser at Livermore National Lab. Each capacitor can store 1450 J of electrical PE when a potential difference of  $1.0 \times 10^4$  V is applied across its plates. What is the capacitance of this capacitor?
- The largest lasagna in the world was made in California in 1993. It had an area of approximately  $44 \text{ m}^2$ . Imagine a parallel-plate capacitor with this area that is filled with air. If a potential difference of 30.0 V is placed across the capacitor, the stored charge is  $2.5 \mu\text{C}$ .
  - Calculate the capacitance of the capacitor.
  - Calculate the distance that the plates are separated.
  - Calculate the electrical potential energy that is stored in the capacitor.
- On July 16, 2186, a total solar eclipse lasting 7 min, 29 s, will be observed over the mid-Atlantic Ocean. During the eclipse, an observer may need a flashlight to see. If the flashlight draws a current of 0.22 A, how much charge will pass through the light bulb during the eclipse?
- If you were to swim in the Atlantic off the coast of Brazil, the resistance of your body could drop as low as 100  $\Omega$ . An electric eel in Brazil can have a potential difference of up to 650 V across it. If you came into contact with this eel while swimming, what current would be delivered to your body?
- Omega, a laser built at the University of Rochester, New York, generated  $6.0 \times 10^{13}$  W for 1.0 ns in 1995. If this power is provided by  $8.0 \times 10^6$  V placed across the circuit, what is the circuit's resistance?
- The largest wind generator in the world has a rotor diameter of almost 100 m. This generator can deliver 3.2 MW of power. Suppose you connect a 3.0 k $\Omega$  resistor, a 4.0 k $\Omega$  resistor, and a 5.0 k $\Omega$  resistor in series. What potential difference must be applied across these resistors in order to dissipate power equal to 1.00 percent of the power provided by the generator? What is the current through the resistors?
- The largest piece of gold ever found had a mass of about 70 kg. If you were to draw this mass of gold out into a thin wire with a cross-sectional area of  $2.0 \text{ mm}^2$ , the wire would have a length of 1813 km. The wire would also have a resistance per unit length of  $1.22 \times 10^{-2} \Omega/\text{m}$ .
  - What is the resistance of the wire?
  - Suppose the wire were cut into pieces having resistance of exactly 1/2, 1/4, 1/5, and 1/20 of the wire's resistance. If these pieces are reconnected in parallel, what is the equivalent resistance of the four pieces?

- In 1920, there was an electric car that could travel at about 40 km/h and that had about a 45 km range. The car was powered by a 24 V battery. Suppose this battery is connected to a combination of resistors, as shown in the circuit diagram below. What is the battery current?



- The longest-lasting battery in the world is at Oxford University, in England. It was built in 1840 and was still working in 1977, producing a  $1.0 \times 10^{-8}$  A current. The battery provided a potential difference of  $2.0 \times 10^3$  V. If the battery is connected to a group of resistors, as shown in the circuit diagram below, find the value of the equivalent resistance and the value of  $r$ .

