

Electricity problems

1. How large is the resistance of a copper wire with 30 m length and 1.5 mm^2 cross-section?
 $\rho = 0.01786 \text{ }\Omega\text{mm}^2/\text{m}$ (0.357 Ω)
2. We connect 100 Ω resistance to 220 V voltage. How large is the current intensity in the circuit? (2.2 A)
3. We apply 20 V voltage to a circuit with 50 mS conductivity. How large is the current intensity in the circuit? (1 A)
4. We connect $R_1 = 10 \text{ }\Omega$ and $R_2 = 20 \text{ }\Omega$ resistances in parallel. There is 100 mA current intensity flowing through R_1 . How large is the current intensity through R_2 ? (50 mA)
5. We want to produce 1 V output voltage with a voltage divider. The input voltage is 20 V. The upper part of the resistance divider has 19 k Ω resistance. How large should be the resistance of the lower part? (1 k Ω)
6. The resistance of 10 k Ω can dissipate 0.5 W power without any destruction. How large is the highest voltage that can be connected to it? (70.7 V)
7. In a given point of the electric field there is a probe with 0.01 mC charge. A force of 0.02 N acts on the probe. What is the electric field strength in this point? (2000 V/m)
8. A capacitor consists of two aluminum plates of 100 cm^2 surface. Their distance is 0.5 mm. The dielectric is air ($\epsilon = 8.85 \cdot 10^{-12} \text{ F/m}$). How large is the capacity of the capacitor? (177 pF)
9. We connect $C_1 = 200 \text{ pF}$, $C_2 = 400 \text{ pF}$ and $C_3 = 400 \text{ pF}$ capacitors in series. How large is the equivalent capacity? (100 pF)
10. We need an electromagnet with 1 T magnetic induction. The surface area of magnetic poles is 1 cm^2 , their distance is 2 mm. How large magnetic flux should be produced by the coil? (0.0001 Wb)
11. The length of the spark produced by a piezoelectric gas-lighter is 5 mm. How high voltage should be produced by the piezo-crystal to get spark in dry air. The breakdown resistance of dry air is 3000 V/mm. (15 kV)
12. The thickness of a cell membrane is 5 nm. The resting potential of the membrane is 90 mV. How large is the electric field strength in the membrane? (18 MV/m)