Electricity problems

1. How large is the resistance of a copper wire with 30 m length and 1.5 mm^2 cross-section? $\rho = 0.01786\ \Omega mm^2/m$ (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)

3We 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 $R_1 = 10\ \Omega$ and $R_2 = 20\ \Omega$ 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 kΩ resistance. How large should be the resistance of the lower part? (1 kΩ)

6. The resistance of 10 kΩ 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 ($\varepsilon = 8.85 * 10^{-12}$ F/m). How large is the capacity of the capacitor? (177 pF)

9. We connect $C_1 = 200$ pF, $C_2 = 400$ pF and $C_3 = 400$ 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)