Electrostatics Homework Problems:
p. 391: #27, 30, 32, 33, 40

Problems taken from the school's old textbook:
Giancoli, D. (1980). *Physics*, 2nd Ed. Englewood Cliffs, NJ: Prentice Hall.

Helpful constants:

- rest mass of an electron = 9.11×10^{-31} kg
- charge of an electron: -1.6×10^{-19} C
- charge of a proton: 1.6×10^{-19} C

27. The two plates of a capacitor hold +1500 μC and -1500 μC of charge, respectively, when the potential difference between the plates is 388 V. What is the capacitance?

30. An electric field of 16.0×10^6 V/m is desired between two parallel plates each of area 110 cm^2 and separated by 2.00 cm of air. What charge must be on each plate?

32. It takes 6.0 J of energy to move a 2.0 mC charge from one plate of a 60 μF capacitor to the other. How much charge is on each plate?

33. A 3000 pF (p stands for pico, the metric prefix for 1×10^{-12}) air-gap capacitor is connected to a 12 V battery. If a piece of mica (dielectric constant $K_{mica} = 7.0$) is placed between the plates, how much additional charge will then flow from the battery and stored on the capacitor?

40. How much energy is stored by the electric field between two square plates, 10 cm on a side, separated by a 3.0 mm air gap? The charges on the plates are equal and opposite and of magnitude 300 μC. What if the gap were filled with mica?

ANSWERS:

27. 3.87×10^{-6} F, or 3.87 μF
30. 1.56 μC
32. 0.180 C
33. 2.16×10^{-7} C
40. energy stored:
    - without the mica: 1525.4 J
    - with the mica: 218 J.