Some Simple Problems from Chapter 15

1. What must be the magnitude of a uniform electric field, in order that an electron initially at rest gets an acceleration of $2 \times 10^{12}$ m/s$^2$? If the electron is initially at rest how long will it take to get a speed of $5 \times 10^6$ m/s? Ans.: $11.4 \, \frac{N}{C}$, $2.5 \times 10^{-6}$ s

2. By how much will the acceleration due to gravity be changed for a charged mass of 5 g falling downward towards the surface of the earth? The mass is charged with a charge of $4 \times 10^{-8}$ C. The magnitude of the electric field on the surface of the earth is 100 N/C. Ans.: $(a-g) = \frac{E q}{m} = 0.8 \times 10^{-3} \frac{m}{s^2}$

3. At 2 opposite vertices of a square with sides of length 50 cm are located identical positive charges each of charge $10^{-8}$ C and at the third vertex is a charge of the same magnitude but opposite sign. Calculate the magnitude of the electric field at the fourth vertex. Ans.: $E = \frac{k q}{2a^2(2 \sqrt{2} - 1)} = 3.3 \times 10^2 \, \frac{N}{C}$

4. At the vertices of a hexagon with sides of length, $a$, are located charges identical in magnitude but with charges at successive vertices alternating in sign. Calculate the magnitude of the electric field at the center of the hexagon.