Chapter H

Fields

$^{8}/_{10}$

H1 Uniform Electric Fields

In these questions ignore the effects of non-electrical forces.

H1.1 What is the magnitude of the force if a $+6.0 \times 10^{-9}$ C charge is put in a $50\,000$ N C^{-1} field?

H1.2 What magnitude of field do you need to cause a -1.6×10^{-19} C electron to experience a 2.00 N magnitude force?

H1.3 How strong a field do you need to cause a $+3.2 \times 10^{-19}$ C alpha particle to experience a 2.00 N force?

H1.4 What is the strength of the electric field between two metal sheets held 5.0 cm apart, if one is connected to -500 V, and the other connected to $+2000$ V?

H1.5 What is the field strength needed to cause a spark in air, if 240 V can only jump a distance of 8.0×10^{-5} m?

H1.6 An oil drop with a charge of $+1.2 \times 10^{-15}$ C is held between two horizontal metal plates which are 3.0 mm apart.

a) If one plate is earthed (i.e. it is at 0 V) and the other is at $+600$ V, what is the force on the oil drop?

b) If the drop experiences an upwards electrical force, which plate is connected to $+600$ V? The top one or the bottom one?

H1.7 In an accelerator, you want to accelerate electrons (charge = -1.6×10^{-19} C) with a force of 8.0×10^{-12} N as they pass from one metal plate to another. The plates are 2.0 cm apart.

a) If one plate is earthed (i.e. it is at 0 V) what will be the magnitude of the voltage on the other plate?

b) If the electrons start on the earthed plate, is the other plate connected to a positive or negative voltage?

H1.8 What is the force on a $+6.0 \times 10^{-13}$ C charge between two metal surfaces if the surfaces are 5.0×10^{-5} m apart, and the potential difference across the plates is 9.0 V?