Answer on Question #59039, Physics / Electromagnetism |

Calculate the potential difference between the plates of a parallel plate capacitor so that the gravitational force on a proton would be balanced by the electric field (proton mass $=1.67 \times 10^{-27}$ kg, electronic charge $e=1.6 \times 10^{-19}$ C, plate separation is 0.5cm. Take $g=9.8$ m/s^2)

1.4×10^{-6}V

2.0×10^{-6}V

1.7×10^{-6}V

3.2×10^{-6}V

Solution:
Balance of forces:

$$mg = \frac{eU}{d}$$

Therefore,

$$U = \frac{mgd}{e} = \frac{1.67 \cdot 10^{-27} \cdot 9.8 \cdot 0.5 \cdot 10^{-2}}{1.6 \cdot 10^{-19}} = 5.11 \cdot 10^{-10} \, Volts$$

Answer: $5.11 \cdot 10^{-10} \, Volts$