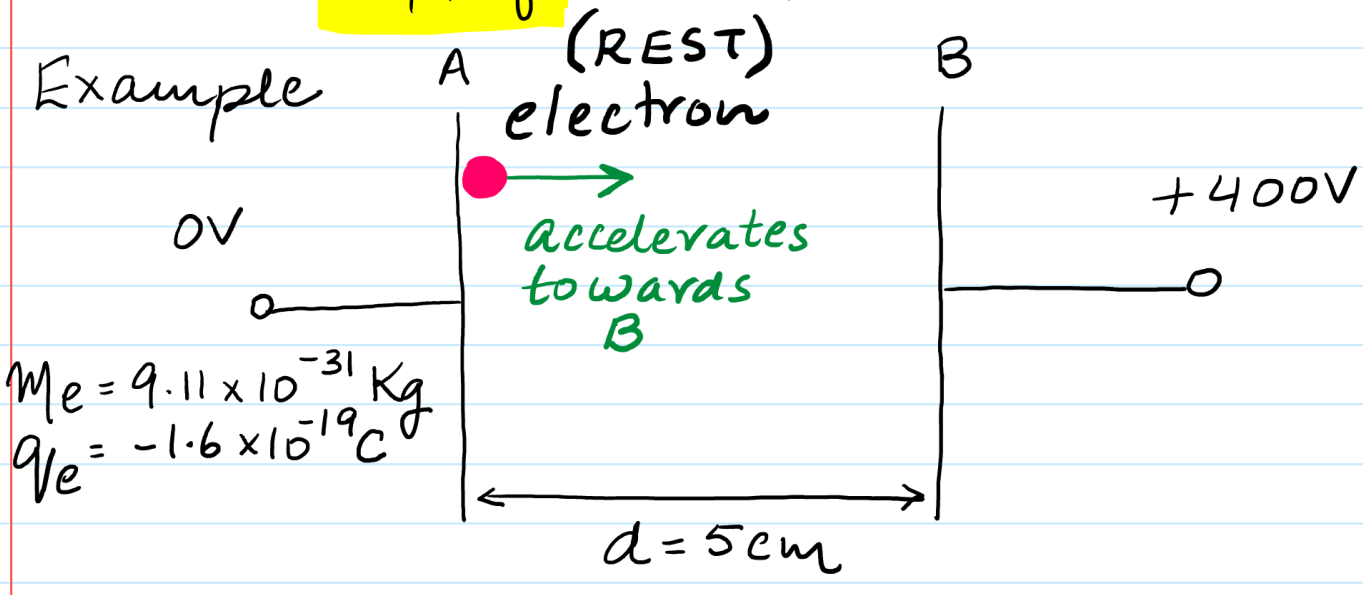
Electric field 2

21 December 2020 09:20

How to apply the formulas. slide (2)

Example



(i) Cal. Electric field Strength

$$E = \frac{V}{d} = \frac{400}{5 \times 10^{-2}}$$

$$E = 8000 \text{ Vm}^{-1} \text{ or NC}^{-1}$$

(ii) Cal force experienced by the electron as it moves in the field

$$E = \frac{F}{q} \quad \text{or} \quad F = Eq$$

your choice

$$F = (8000)(-1.6 \times 10^{-19})$$

$$F = 1.28 \times 10^{-15} \text{ N}$$

(iii) Cal the Work done in moving the electron from A to B

Mechanics

$$W = F \cdot s$$

$$W = (1.28 \times 10^{-15})(5 \times 10^{-2})$$

$$W = 6.4 \times 10^{-17} \text{ J}$$

Electricity. *

$$\text{Voltage} = \frac{W \cdot d}{\text{Charge}}$$

$$400 = \frac{W \cdot d}{1.6 \times 10^{-19}}$$

$$W = 6.4 \times 10^{-17} \text{ J}$$

(iv) Cal the acceleration of the electron

$$F = ma$$

$$1.28 \times 10^{-15} = (9.11 \times 10^{-31}) \times a$$

$$a = 1.4 \times 10^{15}$$

(v) Cal. final speed of the electron as it reaches plate B.

Mechanics

$$v^2 = u^2 + 2as$$

$$v^2 = 0^2 + 2(1.4 \times 10^{15})(0.05)$$

$$v = 1.18 \times 10^{7} \text{ m/s}$$

Electricity

$$\text{Voltage} = \frac{W \cdot d}{\text{Charge}}$$

$$\text{Voltage} = \frac{\text{Kinetic Energy}}{\text{Charge}}$$

$$V = \frac{\frac{1}{2} m v^2}{q}$$

Make velocity (v) the Subject.

$$v = \sqrt{\frac{2qV}{m}}$$ learn.

$$v = \sqrt{\frac{2(1.6 \times 10^{-19})(400)}{9.11 \times 10^{-31}}}$$

$$v = 1.18 \times 10^{7} \text{ m/s}$$