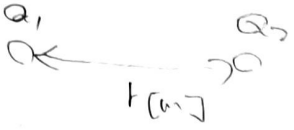
H14 電気磁気学 演習課題 (2024/4/10)

45番 上之慢司

1.2



クーロン力: $F = 5.4 \times 10^{-2}$

$F = 5.4 \times 10^{-2} = 6 \frac{Q_1 Q_2}{r^2}$

rが2倍になるとFは$\frac{1}{4}$倍になり
10倍になるとFは$\frac{1}{100}$倍になる

A. 2倍: 1.35×10^{-2}
10倍: 5.4×10^{-4}

//

1.4

$Q = -1.60 \times 10^{-19}$ C

万有力 $F_1 = G \frac{m_1 m_2}{r^2}$

$F_1 = 6.67 \times 10^{-11} \frac{(9.11 \times 10^{-31})^2}{r^2}$

クーロン力 $F_2 = k \frac{Q_1 Q_2}{r^2}$

$F_2 = 9 \times 10^9 \frac{(-1.60 \times 10^{-19})^2}{r^2}$

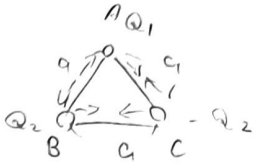
$F_2 = F_1$

$9 \times 10^9 \frac{(-1.60 \times 10^{-19})^2}{r^2} = 6.67 \times 10^{-11} \frac{(9.11 \times 10^{-31})^2}{r^2}$

$= 4.15 \times 10^{42}$

//

1.6

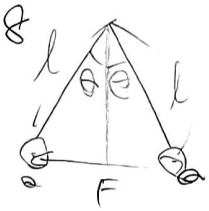


$F_{AB} = 9 \times 10^9 \frac{Q_1 Q_2}{a^2}$

$F_{AC} = 9 \times 10^9 \frac{Q_1 \cdot -Q_2}{a^2}$

$F_{BC} = 9 \times 10^9 \frac{Q_2 \cdot -Q_2}{a^2}$

1.8



(解1) $= 16\pi\varepsilon_0 mgl^2 \sin^3\theta$

$\frac{4}{9 \times 10^9} mgl^2 \sin^3\theta$

H14 電気磁気学 演習課題 (2024/4/18)

45号 上○博司

課題 2

(a) 2.1 $F = 1.5\times10^{-5}$, $Q = 10^{-7}$

$$E = \frac{F}{Q}$$

$$= \frac{1.5\times10^{-5}}{10^{-7}}$$

$$= 1.5\times10^{2}$$

$$= 150\ [N/C]$$ /1

2.2 $Q = 10^{-6}$

(1) 1cm

$$E = \frac{Q}{4\pi\varepsilon_0 r^2}$$

$$= 9\times10^{9}\ \frac{10^{-6}}{(1\times10^{-2})^2}$$

$$= 9\times10^{7}\ [N/C]$$ /1

(2) 20cm

$$E = 9\times10^{9}\ \frac{10^{-6}}{(20\times10^{-2})^2}$$

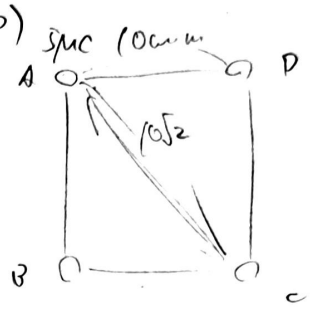
$$= 2.25\times10^{5}\ [N/C]$$

(3) 3m

$$E = 9\times10^{9}\ \frac{10^{-6}}{3^2}$$

$$= 1.0\times10^{3}\ [N/C]$$ /

(b)



$$E_B = \frac{Q}{4\pi\varepsilon_0 r^2}$$

$$= 9\times10^{9}\ \frac{5\times10^{-6}}{(10\times10^{-3})^2}$$

$$= 4.5\ [N/C]$$

E_D : E_B と同じ距離にあるので

$E_D = E_B = 4.5\ [N/C]$

$$E_C = 9\times10^{9}\times\frac{5\times10^{-6}}{(10\sqrt{2}\times10^{-3})^2}$$

$$= 2.25\ [N/C]$$ /1