

13 周作业：

## Week 13

1) 由题意知  $F_c = \frac{mv^2}{r}$ , 速度方向垂直于磁场

$\therefore$  磁力大小  $F_c = Bqv$ .

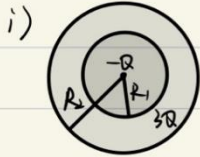
$$\therefore Bqv = \frac{mv^2}{r}$$

$$\therefore B = \frac{mv}{qr} = \frac{m\omega}{q} = \frac{2\pi f m}{q} = \frac{2 \times 3.14 \times 12 \times 9.11 \times 10^{-31}}{1.6 \times 10^{-19}} = 4.30 \times 10^{-10} \text{ T}$$

$$2) E_k = \frac{1}{2}mv^2 = \frac{1}{2}m(2\pi fr)^2 = \frac{1}{2} \times 9.11 \times 10^{-31} \times (2 \times 3.14 \times 12 \times 0.531)^2 = 7.4 \times 10^{-28} \text{ J}$$

14 周作业答案：

## Week 14



ii) 由高斯定理得

$\oint \vec{E} \cdot \hat{n} dA = \frac{\Sigma q_{\text{内}}}{\epsilon_0}$ , 由对称性可知, 电场在球上分布均匀,  $\vec{E}$  沿  $\hat{n}$ , 假设电场方向向内, 则  $\vec{E} \cdot \hat{n} = -E$ .  $\Phi = \oint \vec{E} \cdot \hat{n} dA = -E \int dA = -E \cdot 4\pi r^2$

$$\therefore \Sigma q_{\text{内}} = -Q$$

$$\therefore -E \cdot 4\pi r^2 = \frac{-Q}{\epsilon_0}$$

$$\therefore E = \frac{1}{4\pi\epsilon_0} \frac{Q}{r^2}, \text{ 方向向内}$$

$$\text{iii) } \Phi = \oint \vec{E} \cdot \hat{n} dA = E \int dA = E \cdot 4\pi r^2$$

$$\Sigma q_{\text{内}} = \frac{V_{\text{内}}}{V_{\text{壳}}} \cdot 3Q - Q = \frac{\frac{4}{3}\pi r^3 - \frac{4}{3}\pi R_1^3}{\frac{4}{3}\pi R_2^3 - \frac{4}{3}\pi R_1^3} \cdot 3Q - Q = \frac{r^3 - R_1^3}{R_2^3 - R_1^3} \cdot 3Q - Q$$

$$\text{则 } E = \frac{Q}{4\pi\epsilon_0 r^2} \left[ 3 \left( \frac{r^3 - R_1^3}{R_2^3 - R_1^3} \right) - 1 \right], \text{ 方向向内.}$$

$$\text{iv) } \Phi = \oint \vec{E} \cdot \hat{n} dA = E \int dA = E \cdot 4\pi r^2,$$

$$\Sigma q_{\text{内}} = 3Q - Q = 2Q$$

$$\therefore E = \frac{1}{4\pi\epsilon_0} \frac{2Q}{r^2}, \text{ 方向向外.}$$

15 周作业答案：

Week 15

由题中图可得  $\vec{B} \perp \hat{n}$

$$\therefore \vec{B} \cdot \hat{n} = 0$$

$$\therefore \phi = \int \vec{B} \cdot \hat{n} dA = 0$$

$$\therefore |emf| = \left| \frac{d\phi}{dt} \right| = 0$$

$$\therefore I = \frac{emf}{R} = 0, \text{ 即环上无电流}$$