

作业纸

课程名称: 大学物理

班级: 13012246 教学班级: 08012204 姓名: 李林 学号: 112024103 第 1 页

第2章 18. $\oint_S D \cdot dS = \int_{S_1} D_1 \cdot dS + \int_{S_2} D_2 \cdot dS = 2\pi R^2 (D_1 + D_2)$

$$D_1 + D_2 = \frac{Q}{2\pi R^2}$$

$$U = \int_r^\infty \vec{E}_1 \cdot d\vec{r} = \int_r^\infty \vec{E}_2 \cdot d\vec{r} \quad \therefore \vec{E}_1 = \vec{E}_2$$

$$\frac{D_1}{\epsilon_0 \epsilon_1} = \frac{D_2}{\epsilon_0 \epsilon_2} \quad \therefore \vec{E}_1 = \vec{E}_2 = \frac{D_1}{\epsilon_0 \epsilon_1} = \frac{Q}{2\pi \epsilon_0 (\epsilon_1 + \epsilon_2) R^2}$$

$$\sigma_{e1} = -\frac{(\epsilon_1 - 1)Q}{2\pi (\epsilon_1 + \epsilon_2) R^2}$$

$$\sigma_{e2} = -\frac{(\epsilon_2 - 1)Q}{2\pi (\epsilon_1 + \epsilon_2) R^2}$$

21. $\vec{E}_{\max} = \frac{\lambda e}{2\pi \epsilon_1 R_1}$

$$\vec{E}_{\max} = \vec{E}_{\max} \Rightarrow \frac{\epsilon_1}{\epsilon_2} = \frac{R_1}{R_2}$$

$$\vec{E}_{\max} = \frac{\lambda e}{2\pi \epsilon_2 R_2}$$

$$U = \int E \cdot dl = \int_{R_1}^{R_2} E_1 \cdot dl + \int_{R_2}^{R_3} E_2 \cdot dl$$

$$= \int_{R_1}^{R_2} \frac{\lambda e}{2\pi \epsilon_1 r} \cdot dl + \int_{R_2}^{R_3} \frac{\lambda e}{2\pi \epsilon_2 r} \cdot dl = \frac{\lambda e}{2\pi \epsilon_1} \ln \frac{R_2}{R_1} + \frac{\lambda e}{2\pi \epsilon_2} \ln \frac{R_3}{R_2}$$

$$C = \frac{\lambda e}{U} = \frac{2\pi}{\frac{1}{\epsilon_1} \ln \frac{R_2}{R_1} + \frac{1}{\epsilon_2} \ln \frac{R_3}{R_2}}$$

联系方式: _____

作业纸

课程名称: _____


第 2 页

学号: _____

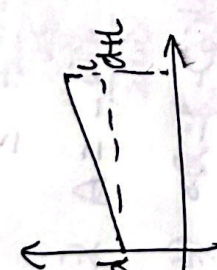
姓名: _____

教学班级: _____

班级: _____

23. 
$$C = C_{A1} + \frac{C_{A3}C_{A4}}{C_{A3} + C_{A4}} = 7.08 \times 10^{-6} \text{ F}$$

$$C = C_{A3} + C_{A4} = 1.06 \times 10^{-9} \text{ F}$$

24. 
$$C = \int_0^a \frac{\epsilon_0 \epsilon_1 x}{\frac{x}{\epsilon_1} + d} = \frac{\epsilon_0 \epsilon_1}{L} \ln\left(1 + \frac{1}{\epsilon_1}\right)$$

25. $C_1 = \frac{\epsilon_0 \epsilon_1 S}{\frac{d}{\epsilon_1}}$ $C_2 = \frac{\epsilon_0 \epsilon_2 S}{d}$

$$C = \frac{2\epsilon_0 \epsilon_1 \epsilon_2 S}{d(\epsilon_1 + \epsilon_2)}$$

26. $C_1 = \frac{1}{2} \frac{4\pi \epsilon_0 k_1 k_2}{k_2 + k_1}$ $C_2 = \epsilon_1 k_1$

$$C = C_1 + C_2 = 2\pi \epsilon_0 (\epsilon_1 + 1) \frac{k_1 k_2}{k_2 + k_1}$$

联系方式: _____

作业纸

课程名称: _____

第 3 页

姓名: _____

学号: _____

教学班级: _____

班级: _____

31. $U_1 = (C+Q)U_C \Rightarrow C_2 = 233pF$ 

$$\Delta W_e = \frac{1}{2} C U_1^2 - \frac{1}{2} (C+Q) U_1^2$$

$$= 3.5 \times 10^{-7} J$$

$$35. (1) \Delta W_e = \frac{1}{2} \frac{Q^2}{C} - \frac{1}{2} \frac{Q^2}{C_0}$$

$$= -\frac{Q^2 b}{2 \epsilon_0 S}$$

$$(2) A = -\frac{Q^2 b}{2 \epsilon_0 S} C_0$$

$$(3) \Delta Q = (C-C_0)U \quad W_S = C Q U = (C-C_0)U^2$$

$$\Delta W_e = \frac{1}{2} C U^2 - \frac{1}{2} C_0 U^2 = \frac{1}{2} (C-C_0) U^2 = \frac{\epsilon_0 U^2 b}{2 d (a-b)}$$

$$W_S + A' = \Delta W_e$$

$$A' = -\frac{\epsilon_0 U^2 S b}{2 d (a-b)}$$

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