

## 杭州电子科技大学

1-5 C B C C C

6-10 D C C A C

11.  $V_0 + bt \quad \sqrt{b^2 + \frac{(V_0 + bt)^2}{R^2}}$

12.  $\frac{m}{M} \vec{v}_1$

13.  $-\frac{k W_0^2}{9J}$

14.  $\frac{q_1 + q_2}{\epsilon_0}$

15.  $\frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r}$

16.  $r_1$  减小

17.  $\epsilon_r Q_0 \quad E_0$

提示:  $C = \frac{\epsilon S}{4\pi k d} \quad \epsilon_{\text{总}} = 1 \therefore C' = \epsilon_r C$

由于与电源保持连接  $U$  不变

$$Q_0 = C U$$

$C$  变为原来的  $\epsilon_r$  倍

$$Q' = C' U = \epsilon_r C U = \epsilon_r Q_0$$

$$E_0 = \frac{U}{d} = E, \text{ 场强不变}$$

18. (1)  $f = -kV$

$$a = \frac{-kV}{m} = \frac{dV}{dt}$$

$$-\frac{kV}{m} \cdot dt = dV$$

$$\int_0^V \frac{1}{V} dV = -\frac{k}{m} \int_{V_0}^V dV$$

$$-\frac{k}{m} \int_0^t dt = \int_{V_0}^V \frac{dV}{V}$$

$$V = V_0 e^{-\frac{kt}{m}}$$

(2)  $\frac{dx}{dt} = V$

$$x = \int_0^\infty V_0 e^{-\frac{kt}{m}} dt$$

$$= \frac{m V_0}{k}$$

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19.

$$J_1 = \frac{1}{2} \times 6 \times 0.05 \times 0.05$$

$$= 7.5 \times 10^{-3} \text{ kg/m}^2$$

$$J_2 = 6 \times 10^{-2} \text{ kg/m}^2$$

$$F_{\text{轴}} = mg = 60 \text{ N}$$

设角速度为  $\beta_1, \beta_2$

$$\frac{J_1 \beta_1}{r} + \frac{J_2 \beta_2}{2r} + 3m\beta_1 r = 60 \text{ N}$$

$$\text{解得 } \beta_1 = \frac{400}{9} \text{ rad/s}^2$$

$$\beta_2 = \frac{200}{9} \text{ rad/s}^2$$

$$T = 80 \text{ N}$$

20.  $I_1 = \frac{1}{3} m_1 l^2$

碰撞之前对杆做能量守恒分析

$$\frac{1}{2} \cdot \frac{1}{3} m_1 l^2 \cdot \omega_0^2 + m_1 g \cdot \frac{l}{2} = \frac{1}{2} \cdot \frac{1}{3} m_1 l^2 \omega_1^2$$

$$\text{解得: } \omega_1 = \sqrt{\omega_0^2 + \frac{3g}{l}}$$

对碰撞前后做角动量守恒分析与能量守恒分析

$$I_1 \cdot \omega_1 = -I_1 \cdot \omega_2 + I_2 \cdot \omega_{\text{球}}$$

$$I_2 = m_2 l^2$$

$$\frac{1}{2} I_1 \omega_1^2 = \frac{1}{2} I_1 \omega_2^2 + \frac{1}{2} I_2 \omega_{\text{球}}^2$$

$$\text{解得: } \omega_{\text{球}} = \frac{\frac{1}{3} m_1}{\frac{1}{3} m_1 + m_2} \omega_1$$

$$V_{\text{球}} = \frac{1}{2} \sqrt{\omega_0^2 l^2 + 3gl}$$

$$= \frac{2m_1}{m_1 + 3m_2} \sqrt{\omega_0^2 l^2 + 3gl}$$

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电荷的线密度.

$$\lambda = \frac{Q}{\pi R}$$

$$E = 2 \int_0^{\frac{\pi}{2}} \frac{d\theta \cdot R \cdot \lambda}{4\pi \epsilon_0 \cdot R^2} \cdot \sin\theta$$

$$= \frac{Q}{2\epsilon_0 \pi^2 R^2} \int_0^{\frac{\pi}{2}} \sin\theta d\theta$$

$$= \frac{Q}{2\epsilon_0 \pi^2 R^2}$$

22 (1)

$$\frac{k\sigma \cdot 4\pi r_1^2}{r_1} + \frac{k\sigma \cdot 4\pi r_2^2}{r_2} = 300$$

$$\text{代入 } r_1 = 0.1 \text{ m } r_2 = 0.2 \text{ m}$$

$$\sigma = 8.85 \times 10^{-9} \text{ C/m}^2$$

$$(2) \frac{\sigma r_1}{\epsilon_0} + \frac{\sigma' r_2}{\epsilon_0} = 0 \text{ (高斯定理)}$$

$$\sigma' = -\frac{1}{2} \sigma$$

$$Q = \frac{3}{2} \sigma \cdot 4\pi R^2$$

$$= 6.67 \times 10^{-7} \text{ C}$$

答案虽然由张大爷友情提供, 但是 ztggyds!