第一章前.

1. A 位移+路程 B 位移的大小+路程.

2. A: $\Delta V = 2V$.

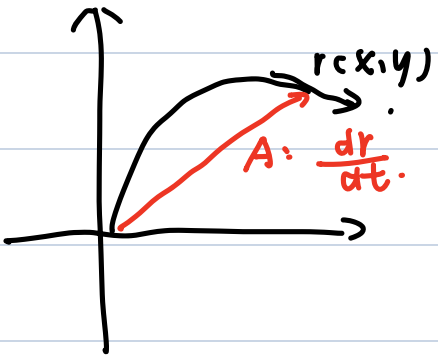
3. $\int_{x_0}^{x} dx = \int_0^3 v\,dt$

$x - 10 = \int_0^3 4t + 2.\,dt$

$x = 2t^2 + 2t\Big|_0^3 + 10$

$x = 18 + 6 + 10 = 34m$.

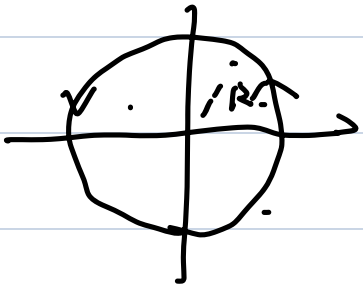
4.



D无方向

5. $r = R\cos\omega t\,i + R\sin\omega t\,j$.

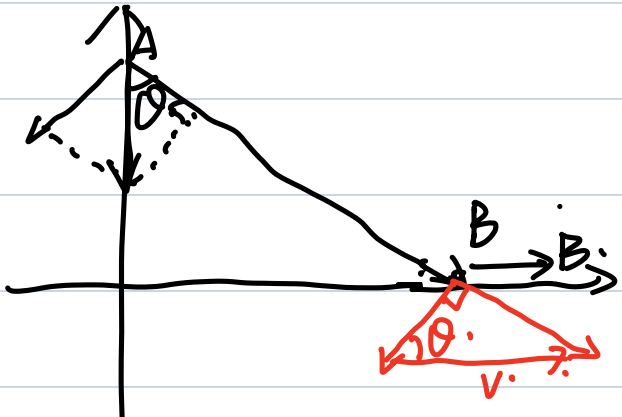
$r' = v = -R\omega\sin\omega t\,\vec{i} + R\omega\cos\omega t\,\vec{j}$.



平均速度 $= \frac{r}{\Delta t} = \frac{2R}{\frac{\pi}{\omega}} = \frac{2R\omega}{\pi}$.

速率 $= \frac{s}{\Delta t} = \frac{2R\pi}{\frac{2\pi}{\omega}} = R\omega$. (速率只有大小).

6



$v_{\text{木}} = v\sin\theta$

$v_A \cdot \cos\theta = v\sin\theta$

$v_A = v\cdot\tan\theta$

11 $r = (3t-4t^2)\vec{i} + (-6t^2+t^3)\vec{j}$

$v = (3-8t)\vec{i} + (-12t+3t^2)\vec{j}$

① 3代入 $x_1 = -21\vec{i} + (-27)\vec{j}$

② 3代入 路程/时间 $x_2 = -9\vec{i} - 9\vec{j}$

③ 3代入 $v = -21\vec{i} - 9\vec{j}$

12. $r = 3t\vec{i} + (19-2t^2)\vec{j}$

$v = 3\vec{i} + (-4t)\vec{j}$

将1S与2S代入 v

$r_1 = 3\vec{i} + 17\vec{j}$

$r_2 = 6\vec{i} + 11\vec{j}$

$\Delta r = 3\vec{i} - 6\vec{j}$

$|\Delta r| = \sqrt{9+36} = 3\sqrt{5}$ $v = 3\sqrt{5}\,m/s$

将2S代入

$v = 3\vec{i} - 8\vec{j}$

$|v| = \sqrt{9+64} = \sqrt{73}\,m/s$

13 $a = 1+12x^2$

$v = \frac{dx}{dt}$

$$v = \frac{dx}{dt} \cdot \frac{dv}{dv}$$

$$v = a\frac{dx}{dv}.$$

$$v\,dv = a\,dx$$

$$\int_0^v v\,dv = \int_0^1 a\,dx$$

$$\frac{1}{2}v^2 = \int_0^1 (1+12x^2)\,dx$$

$$\frac{1}{2}v^2 = x+4x^3\Big|_0^1$$

$$v = \sqrt{10}\ m/s.$$

14. $r = (t-\frac{t^2}{2})\vec{i} + (5-3t+\frac{t^3}{3})\vec{j}$.

$$v = (1-t)\vec{i} + (-3+t^2)\vec{j}$$

$$a = (-1)\vec{i} + (2t)\vec{j}.$$

$$a = -\vec{i} + 4\vec{j}.$$

第二章前.

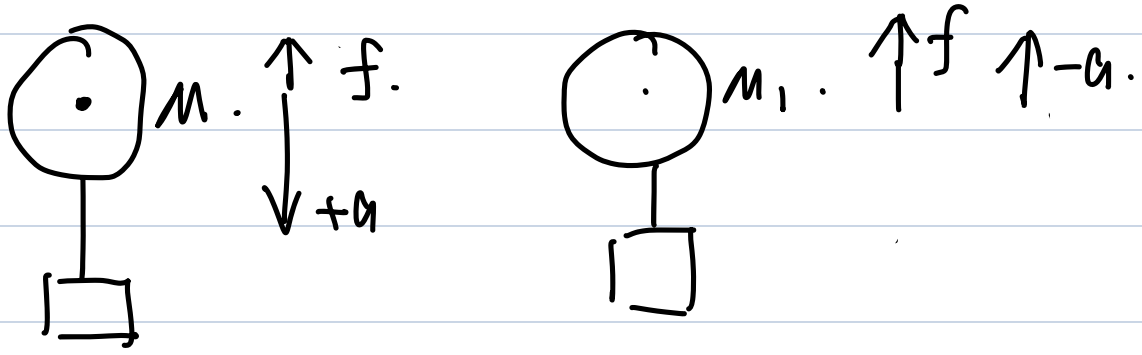
2. A.

3. A.B 同理,

C 木块速度一直增大 支持力一直增大

D 改变.

4.



$$\begin{cases} mg - f = ma. \\ m'g - f = -m'a. \end{cases}$$

$$f = mg - ma.$$

$$-f = -m'(a+g)$$

$$f = m'(a+g)$$

$$\frac{m(g-a)}{a+g} = m'$$

$$\Delta m = m - m'$$

$$= m - \frac{m(g-a)}{a+g}.$$

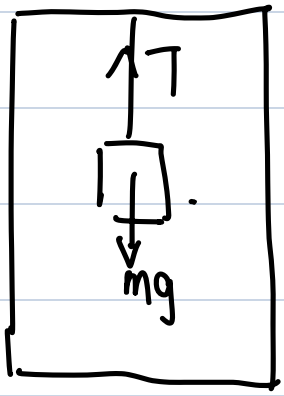
$$\Delta m. = \frac{2ma.}{a+g}$$

5. $F_A = ma = mg - N_1$ $\quad -ma = mg - N_3$

$N_1 = mg - ma.$ $\quad N_2 = mg$ $\quad N_3 = mg + ma.$

$N_3 > N_2 > N_1$.

6.



$\uparrow a_1$.

$$\begin{cases} \frac{1}{2}T - mg = ma_1 \\ T - mg = m \cdot a_2' \end{cases}$$

$T = 2ma_1 + 2mg$.

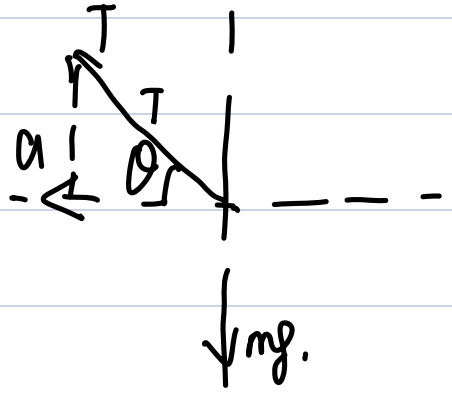
$a_2' = 2a_1 + g$.

7. $\mu F_N = f = mg$

$F_N = \omega^2 \cdot m \cdot R = \frac{mg}{\mu}$

$\omega = \sqrt{\frac{g}{\mu R}}$.

8



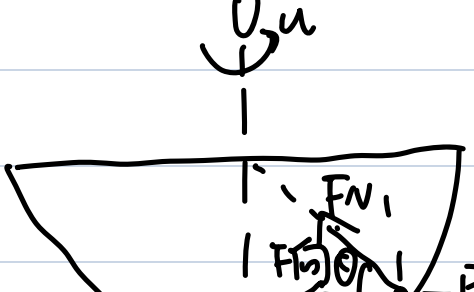
$$\begin{cases} T\sin\theta = mg \\ T\cos\theta = ma \end{cases}$$

$T = \frac{mg}{\sin\theta}$

$\frac{mg\cos\theta}{\sin\theta} = ma$

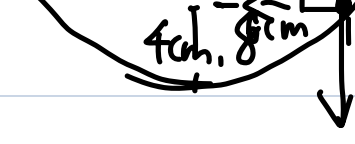
$a = g\cot\theta$

14



$R = 10\,cm$. $\cos\theta = \frac{4}{5}$ $\sin\theta = \frac{3}{5}$

$F_{N1}\sin\theta = mg$



$$\begin{cases} F_{向} = \omega^2 \cdot m \cdot R = F_N \cos\theta \end{cases}$$

$$\omega^2 \cdot m \cdot 0.08 = \frac{mg\cos\theta}{\sin\theta}$$

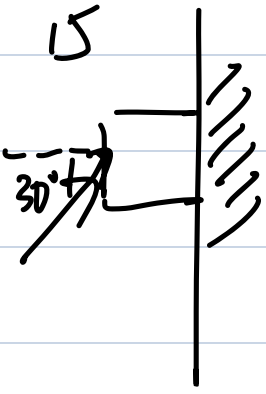
$$\omega = \sqrt{10 \times \frac{4}{3} \times \frac{11}{0.08}}$$

$$= \sqrt{\frac{1000 \times 4}{3 \times 8 \times 2}}$$

$$= \sqrt{\frac{500}{3}}$$

$$= \quad .$$

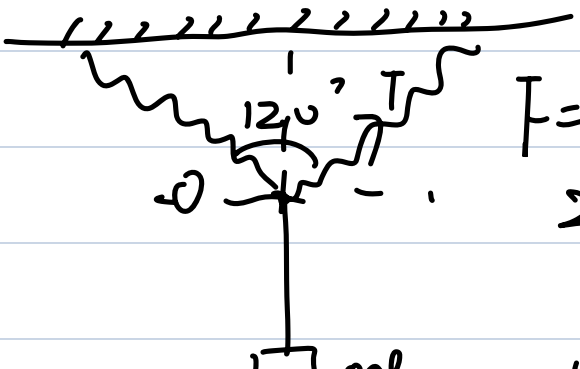
15



$$F \cdot \sin 30° = \mu F \cos 30°$$

$$\frac{\sqrt{3}}{3} = \mu$$

16.



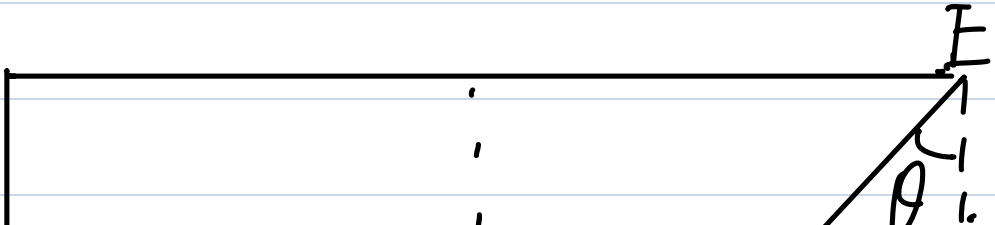
$$F = k\Delta L$$

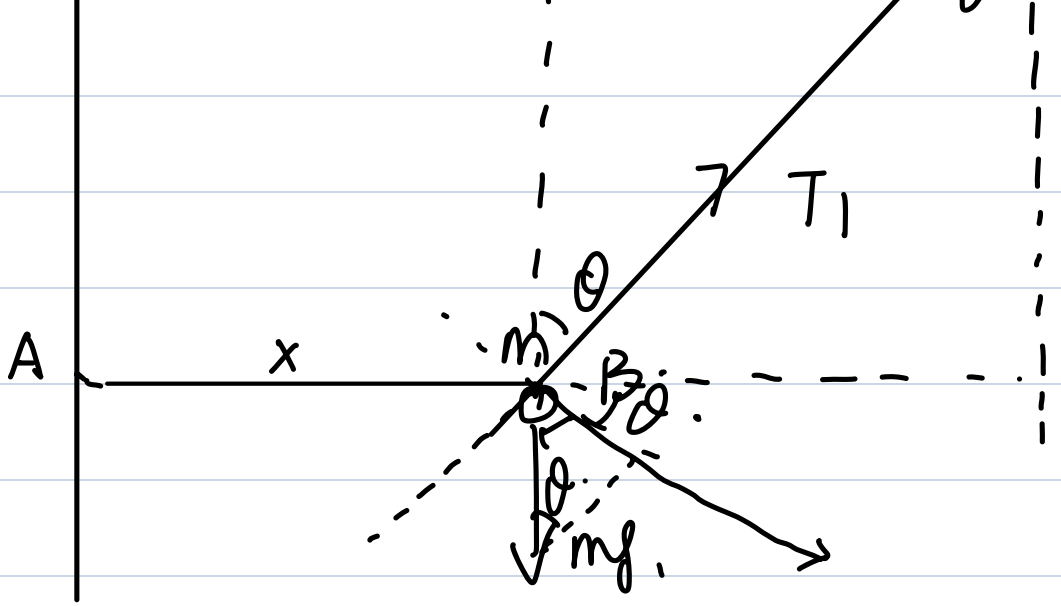
$$2k\Delta L \cos 60° = mg$$

$$\Delta L = \frac{mg}{k}$$

$$L_{总} = L + \frac{2mg}{k}$$

17.





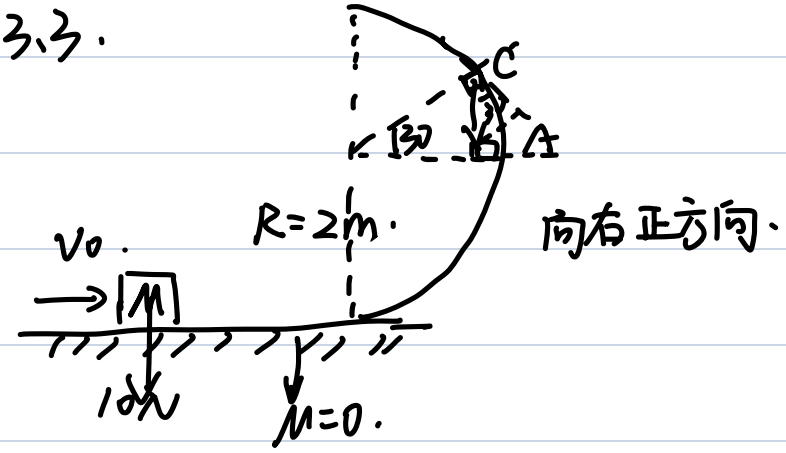
$T_1\cos\theta = mg \qquad T_1 = \frac{mg}{\cos\theta}$.

$T_2 = mg\cos\theta$

$T_1 : T_2 = \frac{mg}{\cos\theta}\ mg\cos\theta = \frac{1}{\cos^2\theta}$

第三章前.

例3.3.



$mgR = \frac{1}{2}mv^2$

$v_1 = \sqrt{2gR}$ v_2是通过子弹 v_3射击.

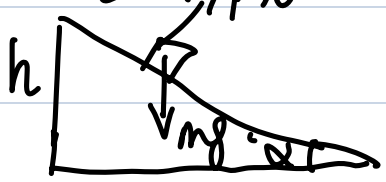
$$\begin{cases} -MV_1 + mV_0 = (M+m)\cdot V_2 \\ \frac{1}{2}(M+m)\cdot V_3^2 - \frac{1}{2}(M+m)\cdot V_2^2 = -(M+m)gh. \\ h = R + R\sin 30^\circ = \frac{3}{2}R \\ F向 = (M+m)g\sin 30^\circ = (M+m)\cdot\frac{V_3^2}{R}. \end{cases}$$

$$V_2 = \sqrt{\frac{7gR}{2}}.$$

$$V_0 = \frac{M}{m}\sqrt{2gR} + \frac{M+m}{m}\sqrt{\frac{7}{2}gR} = 299.15\,m/s.$$

1. D.

2. .



$$\frac{h}{L} = \sin\alpha$$

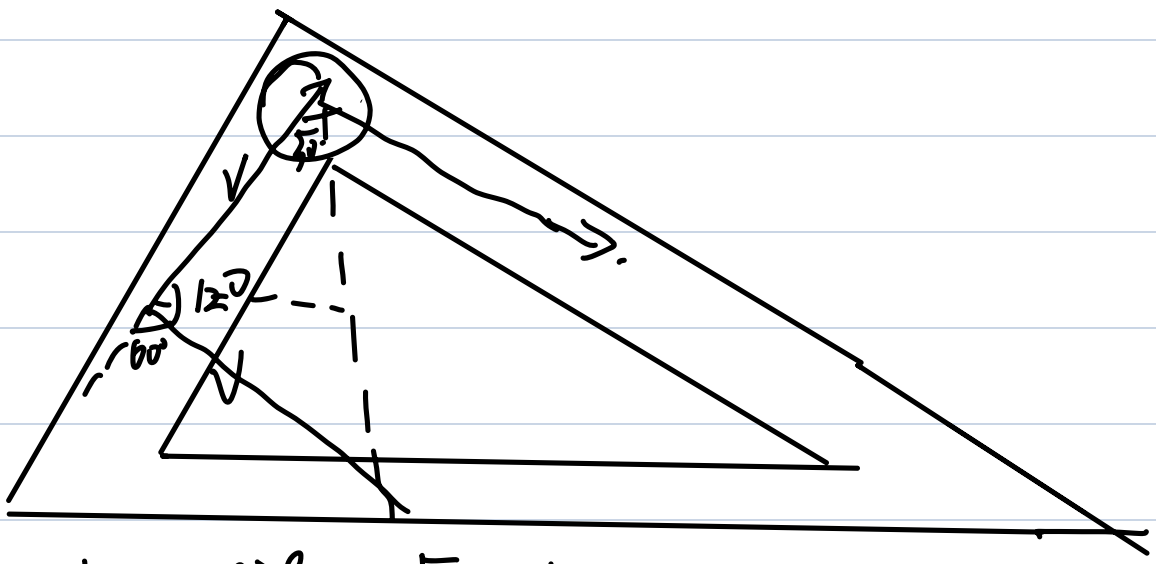
$$h = L\sin\alpha$$

$$\frac{1}{2}mV^2 = mgh.$$

$$V = \sqrt{2gL\sin\alpha}.$$

$$I = m\Delta V = m\sqrt{2gL\sin\alpha}.$$

3.



$$V' = V\cos 30^\circ \cdot 2 = \sqrt{3}V$$

...

4 A

6. ①保守力做正功，势能减少

②. V

③. 摩擦力

7. $r = A\cos\omega t\,\vec{i} + B\sin\omega t\,\vec{j}$ $\quad t = 0 \text{ or } \frac{\pi}{2\omega}$

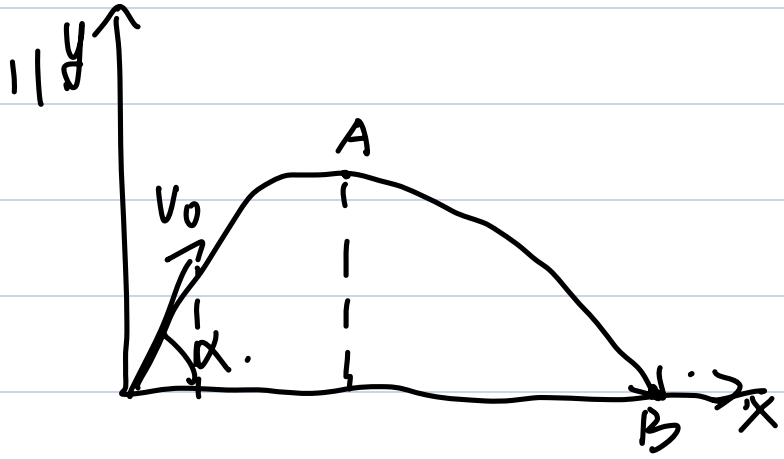
$\frac{dr}{dt} = V = -A\omega\sin\omega t + B\omega\cos\omega t$

$V_{初} = B\omega$

$V_{末} = -A\omega$

$W = \frac{1}{2}mV_{末}^2 - \frac{1}{2}mV_{初}^2$

$= \frac{1}{2}m\omega^2(A^2 - B^2)$.



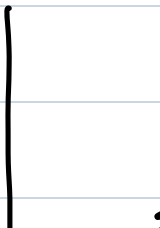
$t = \frac{2V_0\sin\alpha}{g}$

$I = Ft$

$= \frac{2V_0\sin\alpha}{g} mg$

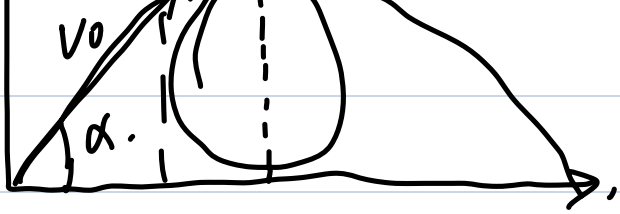
$= 2mV_0\sin\alpha$.

12.



$V_x = V_0\cos\alpha$

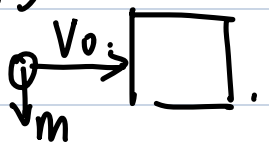
$\frac{V^2}{R}m = mg$



① $\frac{v_0^2}{g} = R_{\max} = \frac{v_0^2 \cos^2\alpha}{g}$.

③. $-mv_0\sin\alpha$.

13.



$mv_0 = (M+m)\cdot v'$

$\frac{mv_0}{M+m} = v'$

$I = mv' = \frac{Mmv_0}{M+m}$.

14.

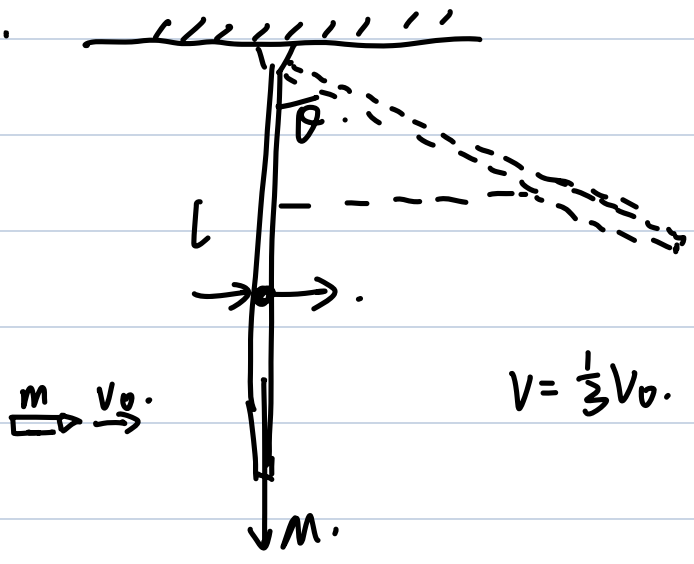
$Ft = mv$

$F = 375 \times 1 \times 50$.

$= 18750N$.

第四章前.

4.3.



$V = \frac{1}{3}v_0$.

$L = Jw = rmv$

$= mr^2w$

$J = \frac{ml^2}{3}$.

$$mv_0\frac{L}{2} = Jw + mv_0\cdot\frac{L}{2}\cdot\frac{1}{3}$$

$$mv_0\frac{L}{2} = \frac{ML^2}{3}w + \frac{L}{6}mv_0$$

$$\frac{1}{3}mv_0 = \frac{ML^2w}{3}$$

$$\frac{mv_0}{ML^2\cdot} = w$$

$$\frac{1}{2}Jw^2 = Mg\frac{L}{2}(1-\cos\theta)$$

$$\cos\theta = 1 - \frac{m^2v_0^2\cdot}{3M^2gL\cdot}$$

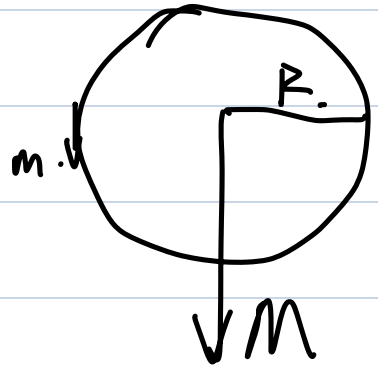
1. $P = F\cdot v\cdot \quad F = \frac{P}{v}$

$$a = \frac{F}{m} = \frac{P}{mv_{平}\cdot}$$

2. $M = J\alpha\cdot$

$$= 3\times 4 - 3\times 5 = -3kN\cdot m\cdot$$

3.



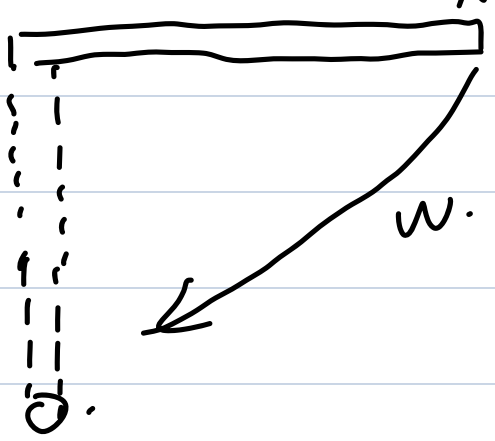
$J_{圆盘} = \frac{MR^2}{2}\cdot$

$J_{小质点} = mR^2\cdot$

$$J = \frac{MR^2}{2} - mR^2\cdot$$

A.

4.



$\vec{M} = |\vec{r}| \times |\vec{mg}| = (|\vec{r}| \cdot |\vec{mg}|) \cdot \sin\theta$.

$= \frac{L}{2} mg \sin\theta$.

$\alpha = \frac{\vec{M}}{|J|}$. ↓.

11. $\beta = 4at^3 - 3bt^2$.

$\int_{w_0}^{w} dw = \int_0^t 4at^3 - 3bt^2\, dt$

$w - w_0 = at^4 - bt^3$.

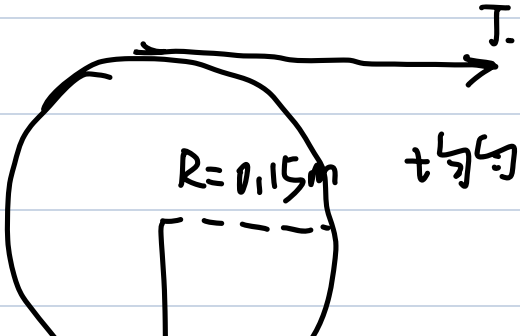
$w = w_0 + at^4 - bt^3$.

$\int_0^{\theta} d\theta = \int_0^t w_0 + at^4 - bt^3\, dt$

$\theta = w_0 t + \frac{a}{5}t^5 - \frac{bt^4}{4}$

J 圆盘 $= \frac{mR^2}{2}$.

12.



t 匀匀地加速. $\alpha = 40\pi$ rad/s.

$\theta = \frac{1}{2}\alpha t^2 = \frac{1}{2} \times 40 \times \frac{1}{4} = 5\pi$.

$mg = 50N$.

$r = \frac{\theta}{2\pi} = 2.5$ 圈.

$F \times R = J \times \alpha$.

$F \cdot R = \frac{mR^2}{2} \times \alpha$

$F = \frac{mR}{2}\alpha$

$= \frac{5}{2} \times \frac{3}{20} \times 40 = 15N$.

$W = \frac{1}{2} J w^2 - 0$

$= \frac{1}{2} \times \frac{mR^2}{2} \cdot w^2 =$

$= \frac{1}{2} \times \frac{5}{2} \times \frac{9}{400} \cdot 400\pi^2$

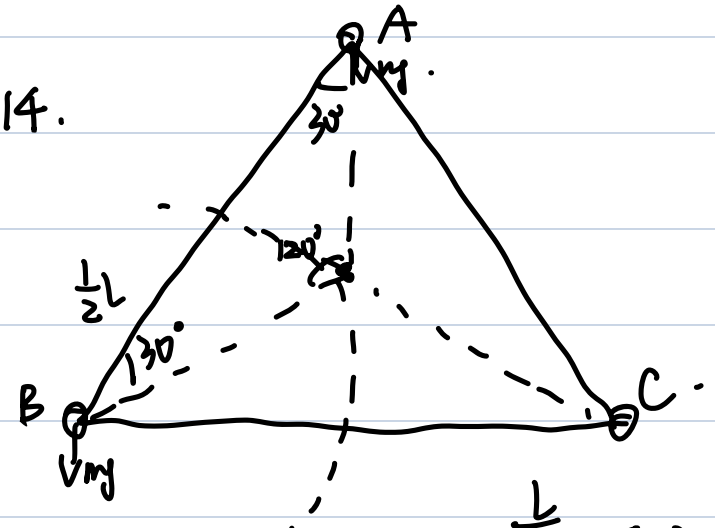
$= \frac{45}{4}\pi^2 \cdot J$.

13.

① $M = mg \times R = \frac{1}{2} mg \times L$.

② $M = \frac{1}{3} mg \times \frac{1}{6} L = \frac{mgL}{18}$.

14.



$J = MR^2$.

① $J_0 = 3 \times m \times \left(\frac{\frac{L}{2}}{\cos 30^\circ}\right)^2$.

$= 3 \times m \times \left(\frac{L}{2} \times \frac{2}{\sqrt{3}}\right)^2$.

$= 3m \times \frac{L^2}{3} = mL^2$.

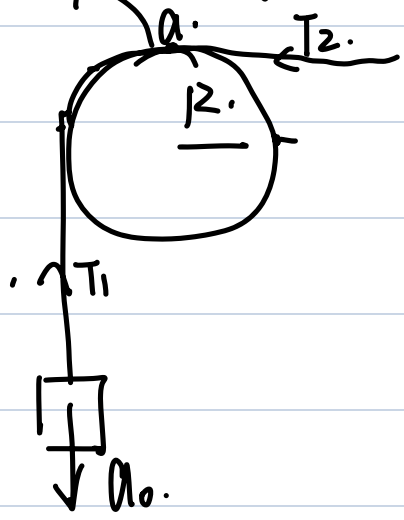
(2)

$J_0 = \cdots$

$J_0 = 2 \times m \times l^2 = 2ml^2$

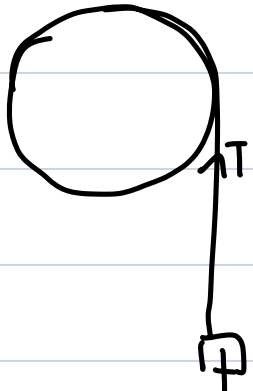
切向与法向 $a_n^2 + a_t^2$ $\frac{v^2}{R}$ $v^2 = 2gh$

15.



$$\begin{cases} mg - T = ma_0 \\ TR = J\alpha \end{cases}$$

16



$$\begin{cases} (mg - T) = ma \\ J\alpha = T \times R \\ \alpha = \frac{a}{R} \end{cases}$$

$T = m(g-a)$

$J = \frac{TR^2}{a}$

$= \frac{m(g-a)R^2}{a}$

↓ mg.

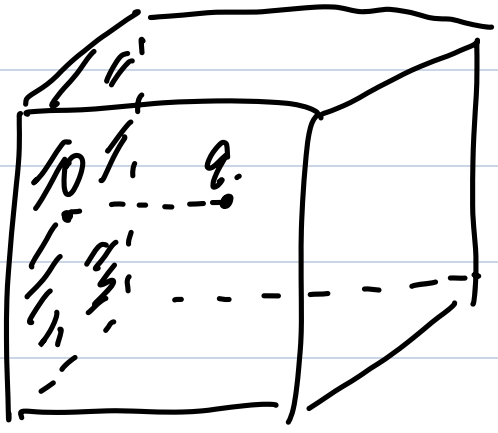
第五章前

1、A 负电

B：方向

D：x.

2.

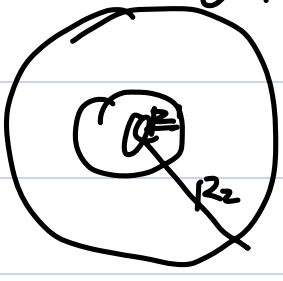


利仝. $\Phi = \frac{q}{\varepsilon_0}$

$\Phi' = \frac{q}{6\varepsilon_0}$

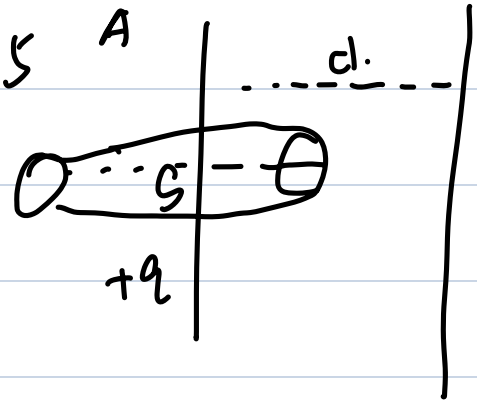
3. $\oint_S E \cdot dS \neq 0$ B.

4.



E_1： $4\pi r^2 \cdot E_1 = \frac{Q}{\varepsilon_0}$ $E_1 = \frac{Q}{\varepsilon_0 4\pi r^2}$.

5



B. 设 $\sigma = \frac{q}{S}$.

$2E \cdot S = \frac{\sigma S}{\varepsilon_0}$

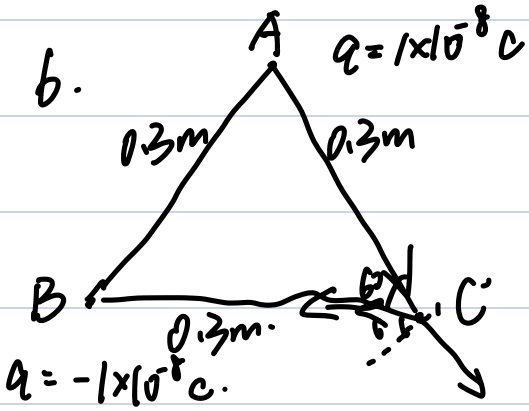
$E = \frac{\sigma}{2\varepsilon_0} = \frac{q}{2S\varepsilon_0}$.

$F = Eq = \frac{q^2}{2S\varepsilon_0}$.

$k = 9\times10^9$.

$V = \frac{q}{kR}$.

6.



① $E = \frac{kq}{R^2} = \frac{q}{4\pi\varepsilon_0 R^2}$

$E_{总} = E\times\cos30^\circ\times2$

$= E = \frac{1\times10^{-8}\times9\times10^9}{0.09}$

$= \frac{90}{9\times10^{-2}} = 1000\,V/m$.

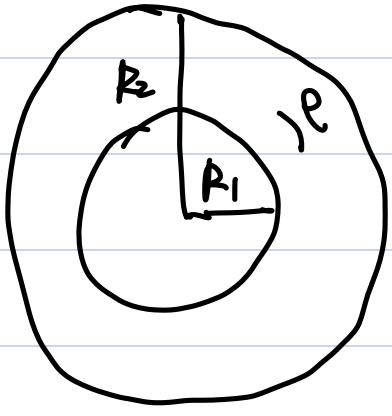
Epsilon

② $V = \frac{kq}{R} - \frac{kq}{R} = 0\,V$

11. $\Phi = E S_0 \cdot \sin\theta$

12. $\oint E\cdot dS = \frac{q_2}{\varepsilon_0}$

13



$q_1\ q_2$.

$\langle 1\rangle = 0$.

<2> $V = \frac{4}{3}\pi r^3 - \frac{4}{3}\pi R_1^3$

$4\pi r^2\cdot E_1 = \frac{\frac{4}{3}\pi(r^3-R_1^3)\rho}{\varepsilon_0}$

$E_1 = \frac{4\pi\rho(r^3-R_1^3)}{3\varepsilon_0\cdot 4\pi r^2}$

$= \frac{\rho(r^3-R_1^3)}{3\varepsilon_0 r^2}$

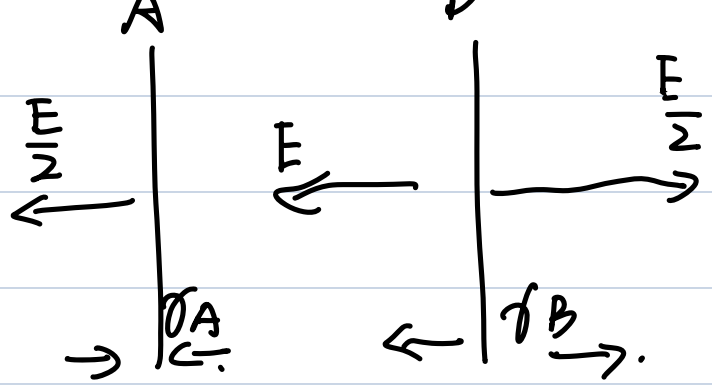
<3> $V = \frac{4}{3}\pi(R_2^3-R_1^3)$

$4\pi r^2\cdot E_2 = \frac{4\pi(R_2^3-R_1^3)\rho}{3\varepsilon_0}$

$E_2 = \frac{(R_2^3-R_1^3)\rho}{3r^2\varepsilon_0}$

B

14



A E_1 B E_2. A负电 B正电.

$$2E\cdot S=\frac{\sigma S}{\varepsilon_0}$$

$$E=\frac{\sigma}{2\varepsilon_0}.$$

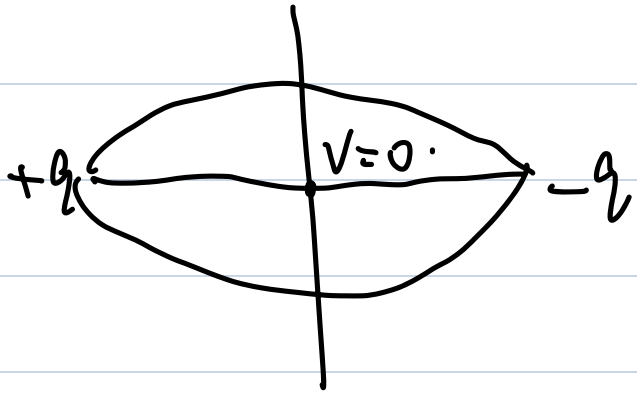
A左侧 右正向

$$\begin{cases}-\frac{E}{2}=\frac{+\sigma A}{2\varepsilon_0}-\frac{\sigma B}{2\varepsilon_0}\\ -E=-\frac{\sigma A}{2\varepsilon_0}-\frac{\sigma B}{2\varepsilon_0}.\end{cases}$$

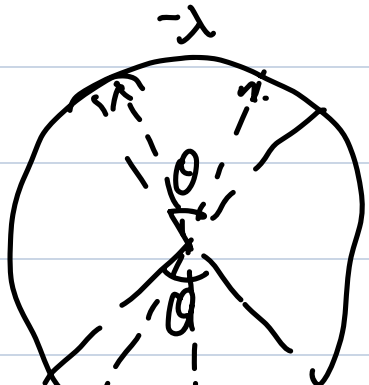
$$-\frac{3E}{2}=-\frac{\sigma B}{\varepsilon_0}\qquad \sigma B=\frac{3E\varepsilon_0}{2}$$

$$\sigma A=\frac{-E\varepsilon_0}{2}$$

15



16



$$dq=\lambda dl=\lambda R d\theta.$$

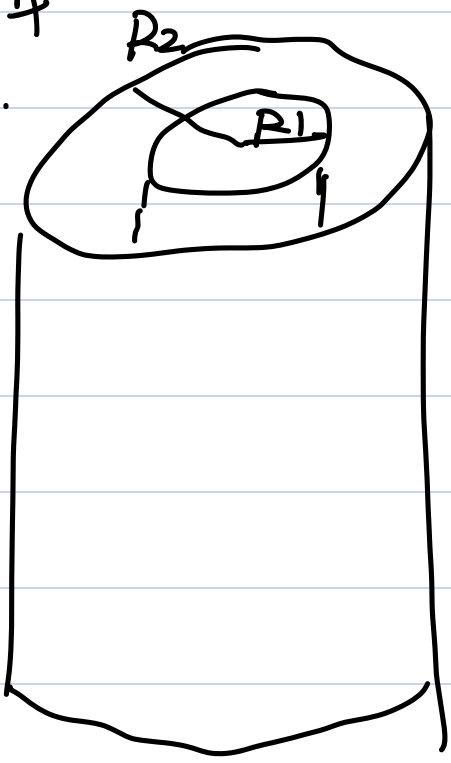
$$\int_0^E dE=4\int_0^{\frac{\theta}{2}}\frac{\lambda R\cos\theta\, d\theta}{4\pi\varepsilon_0 R^2}$$

$$=\frac{\lambda\sin\frac{\theta}{2}}{\pi\varepsilon_0 R}$$

$V=0$.

第六章

6.2.



$R_1 = 2.0cm$

$R_2 = 2.3cm$;

设单位线密度 λ.

$$E \cdot 2\pi r l = \frac{\lambda l}{\varepsilon}$$

$$E = \frac{\lambda_m}{2\pi\varepsilon r}$$

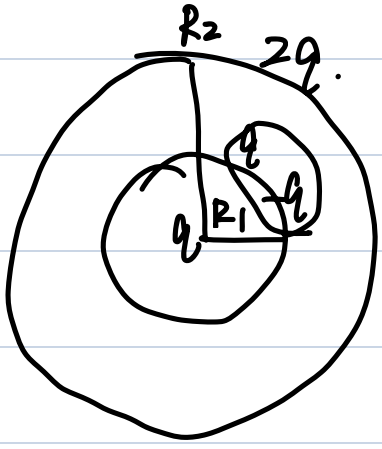
$$E = \frac{\lambda_m}{2\pi\varepsilon_0 R_1} \le E_b$$

$$\lambda_{max} \le 2\pi\varepsilon_0 R_1 E_b$$

$$U_{1m} = \int_{R_1}^{R_2} E\,dr = \int_{R_1}^{R_2} \frac{\lambda}{2\pi\varepsilon r}\,dr = \frac{\lambda_m}{2\pi\varepsilon} \ln\frac{R_2}{R_1} = R_1 E_b \cdot \ln\frac{R_2}{R_1}$$

$= 42kV$

4.

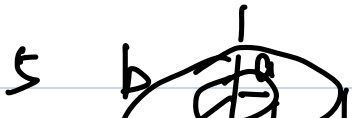


$$V = \frac{Q}{kR}$$

$$= \frac{2q}{4\pi\varepsilon_0 R_2}$$

$$= \frac{q}{2\pi\varepsilon_0 R_2}$$

5



$$E \cdot 2\pi r l = \frac{\lambda l}{\varepsilon_0}$$

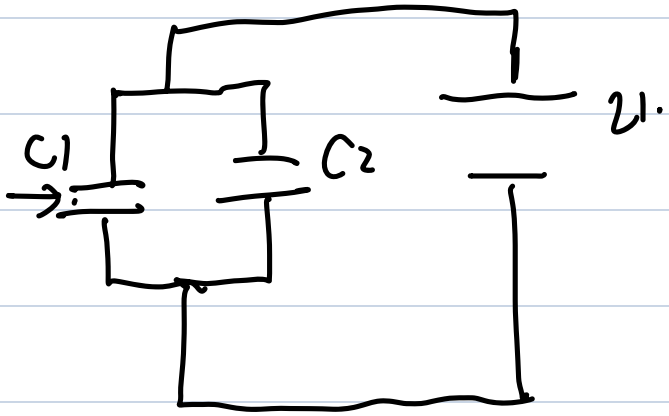
$$E = \frac{\lambda}{2\pi r \varepsilon_0}$$

$$\int_0^U du = \int_a^b E\,dr$$

$$U = \frac{\lambda}{2\pi\varepsilon_0} \ln\frac{b}{a}$$

6. $C = \frac{\varepsilon S}{4k\pi d}$ C.

8.



$C_{并} = C_1 + C_2$.

$C = \frac{\varepsilon S}{4k\pi d}$.

$C_2 = \frac{Q}{U}$ 不变.

$C_1 = \frac{Q}{U}$.

9. $V = \frac{Q}{kR}$.

球形电容器仅与自身半径有关

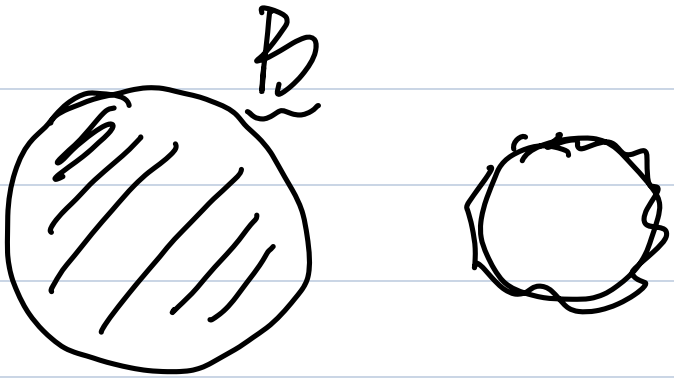
$C = \frac{Q}{U} = 4\pi\varepsilon_0 R$.

B

8 B.

$C = \frac{Q}{U} = \frac{Q}{U_{AB}}$.

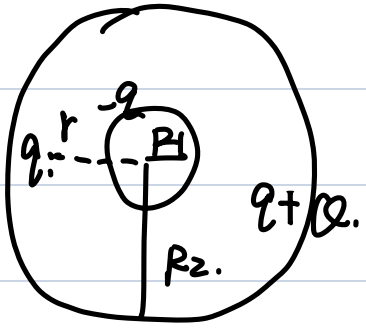
10



$V_1=0$ $V_2<0$.

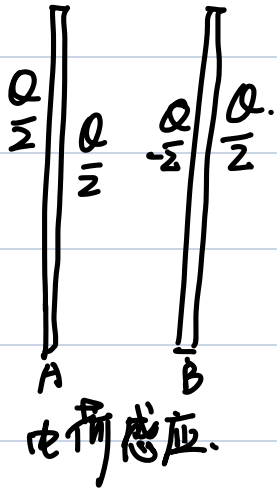
11. 不变，；成对、

12



$$V=\frac{Q}{R_2}=\left(\frac{q}{r}-\frac{q}{R_1}+\frac{Q+q}{R_2}\right)$$

13



电荷感应.

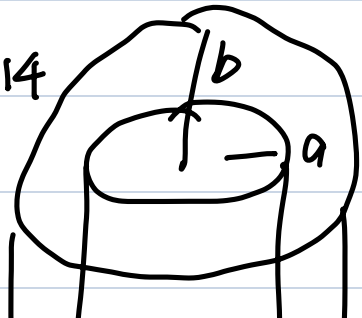
$$\sigma_{A左}=\frac{Q}{2S}$$

$$\sigma_{A右}=\frac{Q}{2S}$$

$$\sigma_{B左}=-\frac{Q}{2S}$$

$$\sigma_{B右}=\frac{Q}{2S}$$

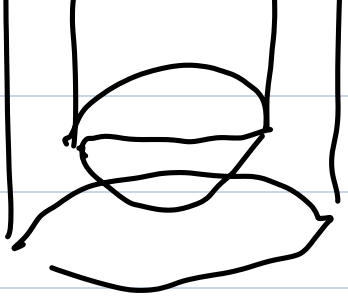
14



$$E\cdot 2\pi r\,dx=\frac{\lambda\,dx}{\varepsilon_0}$$

$$E=\frac{\lambda}{2\pi r\varepsilon_0}$$

$$\int_0^u du=\int_a^b E\,dr$$

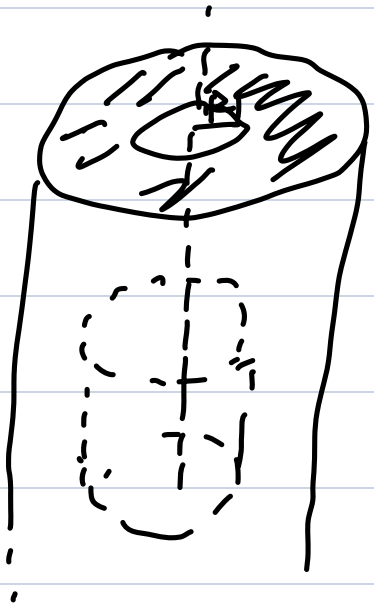


$$V = \frac{\lambda}{2\pi\varepsilon_0} \ln\frac{b}{a}$$

$$\frac{V 2\pi\varepsilon_0}{\ln b - \ln a} = \lambda$$

$$E = \frac{2\pi\varepsilon_0 V}{(\ln b - \ln a)\cdot 2\pi r\varepsilon_0} = \frac{V}{r(\ln b - \ln a)}$$

15



$$E \cdot 2\pi r L = \frac{\lambda \cdot L}{\varepsilon_0}$$

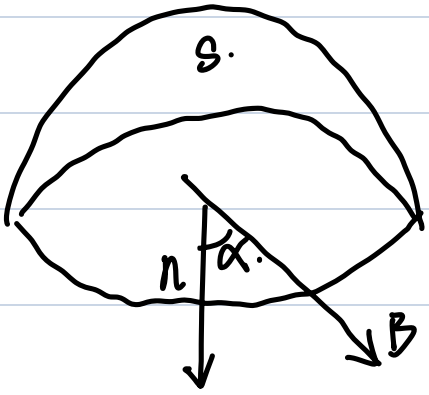
$$E = \frac{\lambda}{2\pi r\varepsilon_0}$$

$$E_{\text{半}} = \frac{E}{\varepsilon_r} = \frac{\lambda}{2\pi r\varepsilon_0\varepsilon_r}$$

16. 不变.

第八章前

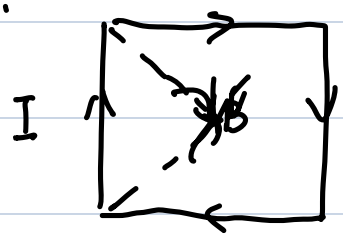
1. D



$\Phi = -\pi r^2 B \cos\alpha$.

$= 1.47\times10^{-6}$

2.

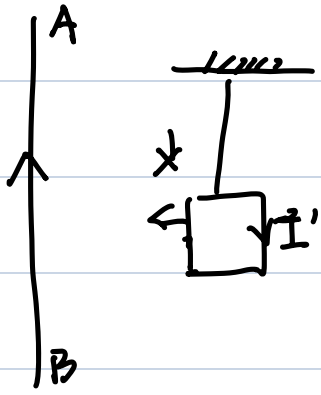


单个的 $B = \frac{\mu_0 I}{4\pi R}(\cos\theta_1 - \cos\theta_2) = \frac{\sqrt{2}\mu_0 I}{4\pi \frac{L}{2}}$

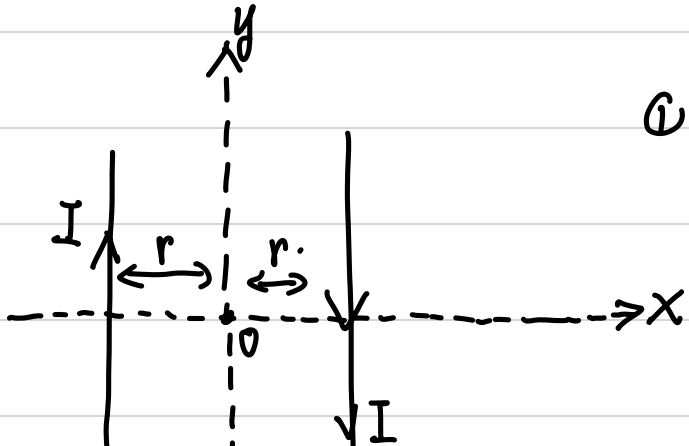
$B_{1和2} = 4\times\frac{\sqrt{2}\mu_0 I}{2\pi L} = \frac{2\sqrt{2}\mu_0 I}{\pi L}$.

$B_2 = 0$

3. A

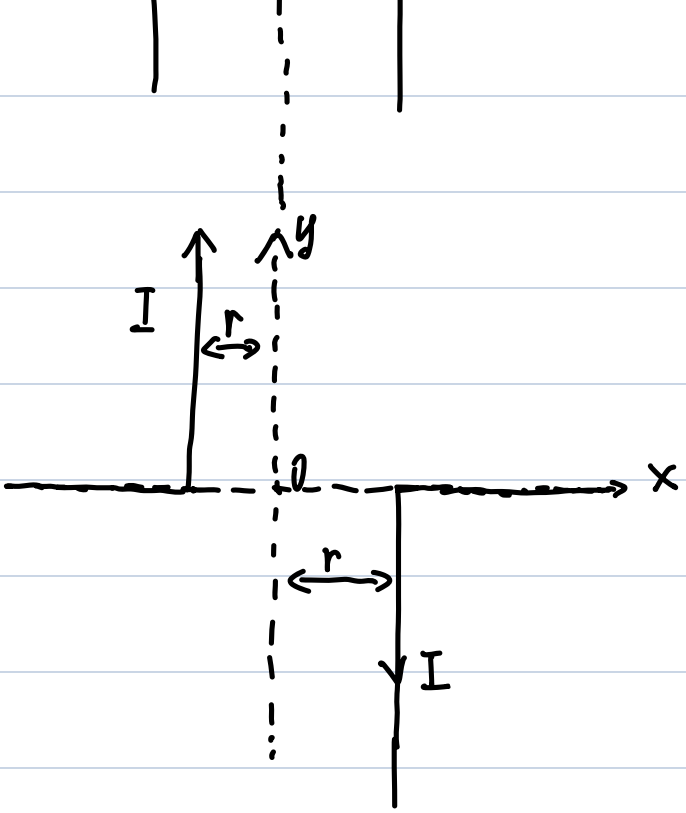


4.



① $B_{单根在O点} = \frac{\mu_0 I}{2\pi r}$.

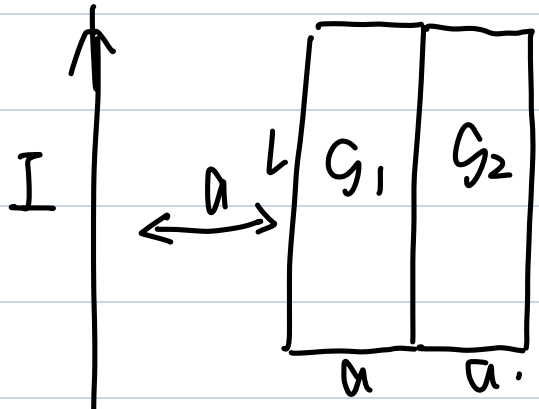
$B_0 = \frac{\mu_0 I}{\pi r}$.



$B_{半环}B = \frac{\mu_0 I}{4\pi r}$

$B' = \frac{\mu_0 I}{2\pi r} = \frac{B_0}{2}$.

14



$B = \frac{\mu_0 I}{2\pi r}$.

$\varphi_1 = \int_a^{2a} \frac{\mu_0 I}{2\pi r} L\, dr. = \frac{\mu_0 I}{2\pi} \ln\frac{2a}{a}$

$\varphi_2 = \int_{2a}^{3a} \frac{\mu_0 I}{2\pi r} L\, dr. = \frac{\mu_0 I}{2\pi} \ln\frac{3a}{2a}$.

$\varphi_1 : \varphi_2 = \frac{\ln 2a - \ln a}{\ln 3a - \ln 2a} = \ln 2 : \ln\frac{3}{2}$.

17 a: $\mu_0 I$.

b: $\mu_0 I$

c: $> \mu_0 I$.

22. $B = \frac{\mu_0 I}{2\pi r}$

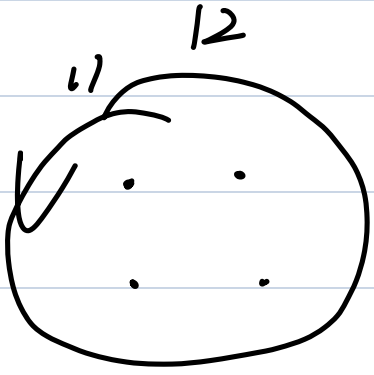
$\Phi = BS = \int_{d_1}^{d_1+d_2} Bl\,dr$

$= \int_{d_1}^{d_1+d_2} \frac{\mu_0 I l}{2\pi} r\,dr$

$= \frac{\mu_0 I l}{2\pi} \ln\frac{d_1+d_2}{d_1}$

第九章 前.

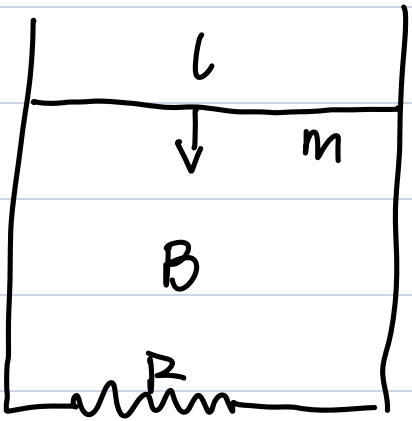
1.



$\mathcal{E} = -\frac{n\Delta BS}{\Delta t} = 12 \times 0.05 = 0.6$

$I = \frac{0.6}{4} = 0.15\,A$ 逆.

2.



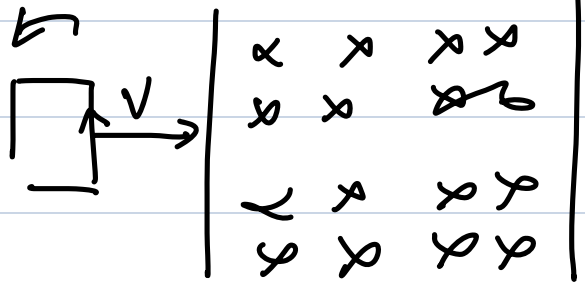
$E = Blv$

$F = \frac{B^2 l^2 v}{R} = mg.$

$v = \frac{mgR}{B^2 l^2}.$

D

3.



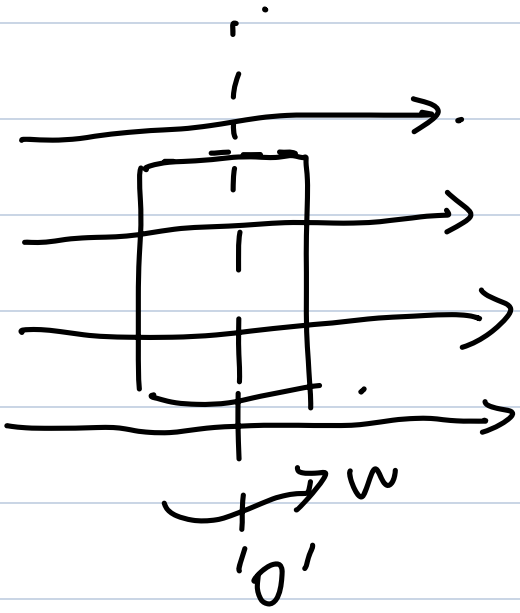
12 正

中间能跳

出C

以速度V进入代表相应有外力做工恒定.

4



$E = nBSw$.

$I = \frac{nBSw}{R}$.

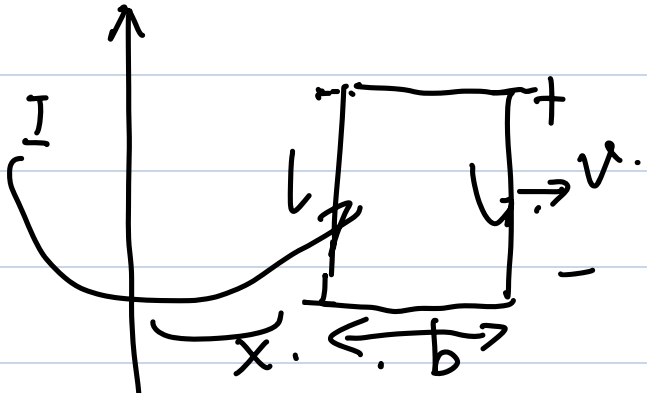
A: V

B: $\frac{S介}{R介}$

C: X

D X.

22.



$B=\frac{\mu_0 I}{2\pi r}$ $B_1=\frac{\mu_0 I}{2\pi x}$ $B_2=\frac{\mu_0 I}{2\pi(x+b)}$

$$\Phi=\int_x^{x+b} B l\, dr$$
$$=\int_x^{x+b}\frac{\mu_0 I l}{2\pi r}dr=\frac{\mu_0 I l}{2\pi}\ln\frac{x+b}{x}$$

$\Phi=MI$

$$\frac{\mu_0 l}{2\pi}\ln\frac{x+b}{x}=\frac{\mu_0 I l}{2\pi}$$
$$\frac{x+b}{x}=e$$
$$x+b=xe$$
$$x(1-e)=-b$$
$$x=\frac{b}{e-1}$$

$$E=(B_2-B_1)lv$$
$$=\frac{\mu_0 v l(e-1)^2}{2\pi e b}$$

第十四章

$\Delta=n_2r_2-n_1r_1$ 光程差

$\Delta\varphi=2\pi\frac{\Delta}{\lambda}$

$$\Delta=\pm\begin{cases}k\lambda & \text{加强}\\ (2k+1)\frac{\lambda}{2} & \text{减弱}\end{cases}$$

杨式双缝

双缝

$$d\sin\theta = \pm \begin{cases} k\lambda & \text{明} \\ (2k+1)\cdot\frac{\lambda}{2} & \text{暗.} \end{cases}$$

$$\sin\theta \approx \tan\theta = \frac{x}{d'}$$

屏到双缝.

$$x = \pm \begin{cases} k\cdot\frac{d'}{d} & \text{明} \\ (k+\frac{1}{2})\cdot\frac{d'}{d} & \text{暗} \end{cases}$$

薄膜干涉.

$$\delta = 2nd + \frac{\lambda}{2}(\text{或无}) = \begin{cases} k\lambda & \text{明.} \\ (2k+1)\cdot\frac{\lambda}{2} & \text{暗} \end{cases}$$

劈尖干涉

$$d_{k+1} - d_k = \frac{\lambda}{2n} = \frac{\lambda_n}{2}.$$

$$\theta \approx \frac{\lambda_n}{2b} = \frac{D}{L}.$$

牛顿环.

$$r_k = \begin{cases} \sqrt{(k-\frac{1}{2})R\lambda_n} & \text{明} \\ \end{cases}$$

$\sqrt{kR\lambda n}$ 暗.

$R = \frac{D_{k+m}^2 - D_k^2}{4m\lambda}$

单缝衍射.

(1) b 单缝. 透镜焦距 f. 衍射角 θ.

$b\sin\theta = \begin{cases} 0 & \text{中央明纹} \\ 2k\cdot\frac{\lambda}{2} = k\lambda & \text{暗纹} \\ (2k+1)\cdot\frac{\lambda}{2} & \text{明纹} \end{cases}$

(2) 产生明显衍射的条件是 $\lambda = b$ 或 $\lambda > b$.

(3) 相邻暗条纹之间距离为明纹宽度

中央 $l_0 = \frac{2f\lambda}{b}$

其余 $l = \frac{f\lambda}{b}$

圆孔衍射

$\theta_0 = 1.22\frac{\lambda}{D}$ → λ 时孔径.

$\theta_0 = \frac{\lambda}{L}$.

光栅衍射

光栅: 透光缝宽为 b 不透光为 b'.

光栅常数 b+b' 衍射角为 θ.

$(b+b')\sin\theta = \pm k\lambda$ 主极大.

说明

① $k_{max} < \frac{b+b'}{\lambda}$.

② $\frac{b+b'}{b} = \frac{k}{k'}$ $k' = 1, 2, 3 \cdots$

例 14.2.

$$\begin{cases} 2nd + \frac{\lambda_1}{2} = k\lambda_1 \\ 2nd + \frac{\lambda_2}{2} = (2k+1)\lambda_2 \end{cases}$$

$$k = \frac{\lambda_1}{2(\lambda_1 - \lambda_2)} = 3.$$

代入 $d = 5.92 \times 10^{-7} m = 592\ nm$.

1. $\theta = 3\pi = 2\pi \frac{\delta}{\lambda}$

$$\delta = \frac{3}{2}\lambda.$$

$$nx = \delta$$

$$x = \frac{3\lambda}{2n}$$

2. $\delta = r_2 + (n_2 - 1)t_2 - [r_1 + (n_1 - 1)t_1]$

3. $x = k\frac{D}{d}\lambda$ → 第到反推. 双缝距.

$n = \frac{c}{v} = \frac{\lambda f}{\lambda' f} = \frac{\lambda}{\lambda'}$ $\lambda' = \frac{\lambda}{n}$.

$x = k \cdot \frac{D}{d} \cdot \frac{\lambda}{n} =$

$\Delta x = \frac{D\lambda}{dn} = \frac{d'\lambda}{dn}$.

4. $\Delta x = (n-1)\cdot d = 5\lambda$

$d = 6 \times 10^{-4}$ cm.

13. 衍射条纹 $I_0 = \frac{2f\lambda}{D}$ ↑ I_0 ↓.

$D\sin\theta = (k+1)\frac{\lambda}{2}$ 不动.

14. $I = \frac{2f\lambda}{D}$

$= \frac{2f}{\frac{3}{4}} = \frac{2f}{\frac{3}{2}}$

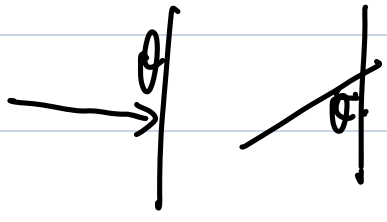
$= \frac{2}{3} \times \frac{2}{3} = \frac{1}{2}$

$\lambda = \frac{v}{f} = \frac{1}{f}$

=

D.

15 $(b+b')\sin\theta = k\lambda$ ↑ B 变大



光栅常数.

16. $(b+b')\sin\theta = k\lambda$.

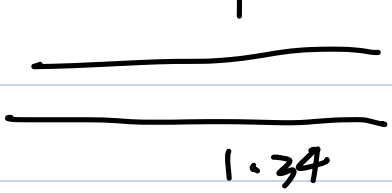
$b+b' = \frac{1}{500} = 2\times10^{-6}$ m.

$$\theta = \arcsin\frac{k\lambda}{b+b'} \quad k=1$$

$$= \arcsin\frac{589.3\times10^{-9}}{2\times10^{-6}}$$

$$\approx 17.1^\circ.$$

25. $n = 1.25$



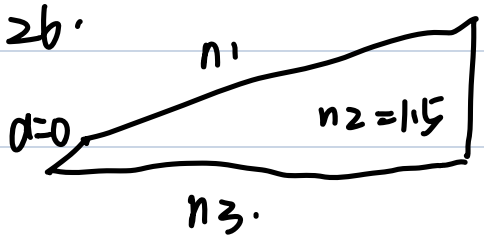
$n_1 < n_2 < n_3$

$$2nd = \lambda.$$

$$d = \frac{\lambda}{2n} = \frac{500\times10^{-9}}{2\times1.25} = 2\times10^{-7}\,m.$$

$$S = \frac{V}{d} = \frac{1}{2\times10^{-7}} = 5\times10^{6}\,m^2.$$

26.

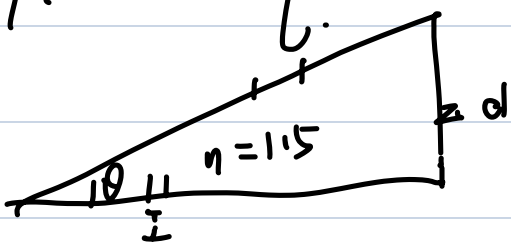


$n_1 > n_2 < n_3$. 明纹.

$$2nd + \frac{\lambda}{2} = k\lambda \cdot (k=2).$$

$$d = \frac{3\lambda}{2\times3} = \frac{\lambda}{2} = 250\,nm.$$

27.



$$L = \frac{\Delta e}{\sin\theta}$$

$$2nd + \frac{\lambda}{2} = (2k+1)\cdot\frac{\lambda}{2}$$

相邻 $\Delta d = d_2 - d_1 = \frac{\lambda}{2n}$

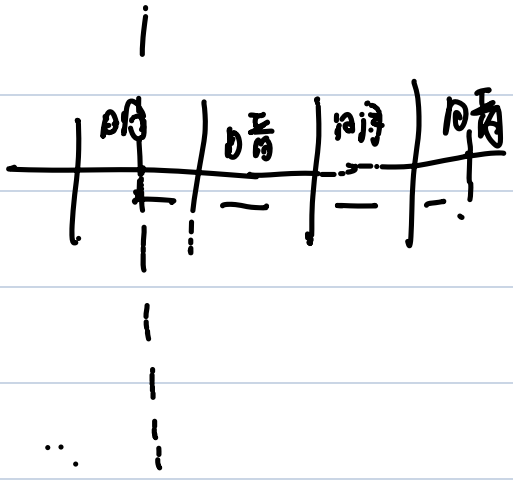
$$\sin\theta = \frac{\Delta d}{L} = \frac{\lambda}{2nL} = \frac{600\times10^{-9}}{2n\times a1.5\times10^{-2}}.$$

$= 1.33 \times 10^{-4}$.

$\theta \approx \sin\theta = 1.33 \times 10^{-4}$ rad.

30. 中央明纹宽度. $I_0 = \frac{2f\lambda}{a}$.

$I_0 = 10^{-3}$ m.



设问

$a\sin\varphi = (2k+1)\frac{\lambda}{2}$.

$\sin\varphi = \frac{3\lambda}{2a}$.

$x_f = f'\sin\varphi = \frac{3\lambda}{2a} \cdot f' = 7.5 \times 10^{-4}$ m.

$\Delta x = 2 \cdot \frac{2\lambda}{a} \cdot f' = 2 \times 10^{-3}$ m.

单缝衍射

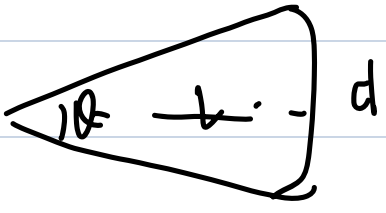
31 $b\sin\theta = k\lambda$.

$b = \frac{\lambda}{\sin\theta} = \frac{632.8 \times 10^{-9}}{\sin 5^\circ} = 7.26 \times 10^{-6}$ m.

圆孔衍射

32. $\theta = 1.22\frac{\lambda}{D} = 2.24 \times 10^{-4}$ rad.

$\theta = \frac{d}{L}$ $\quad L = \frac{d}{\theta} = \frac{2 \times 10^{-3}}{2.24 \times 10^{-4}} = 8.9$ m.



41. $(b+b')\sin\varphi = k\lambda$.

$d\sin 60^\circ = 3\lambda$ ①

$d\sin\varphi = 2\lambda_2$.

$\lambda_2 = \frac{5}{6}\lambda_1 = 510.35\,nm$.

$d\sin\varphi = 3\lambda$.

$d = 2041.4\,nm$.

设紫 λ_1 红 λ_2.

$$\begin{cases} d\sin\theta_1 = 2\lambda_1 \\ d\sin\theta_2 = 2\lambda_2 \end{cases}$$

$\theta_1 = 23.07°$

$\theta_2 = 48.13°$

$\Delta\theta = \theta_2 - \theta_1 \approx 25°$

十六、草前.

16. 2.

$1eV = 1.6 \times 10^{-19}$.

① $W_0 = 4.2eV$.

$h\nu - W_0 = \frac{1}{2}mV_m^2$.

$E_{km} = h\frac{c}{\lambda} - W$

$= 6.63 \times 10^{-34} \times \frac{3 \times 10^8}{250 \times 10^{-9}} - 4.2 \times 1.6 \times 10^{-19}$

$= 1.24 \times 10^{-19}$ J

② $eU_0 = E_{km} = \frac{1}{2}mV^2$.

$U_0 = \frac{1.24 \times 10^{-19}}{1.6 \times 10^{-19}} = 0.775$ V.

③ $\begin{cases} h\nu_0 = W \\ \nu_0 = \frac{c}{\lambda_0} \end{cases}$

$\lambda_0 = \frac{hc}{W} = 296nm$.

3. A

5 D. 频率越大粒子性强

6. $p = \frac{h}{\lambda}$

$p = \frac{h}{\lambda} - \frac{h}{0.2\lambda} = \frac{h}{6\lambda}$

$E_k = pc = \frac{hc}{6\lambda}$

$E = pc = \frac{hc}{\lambda}$.

D.

14. $h\nu$ 红限 $= W_0$

$h\nu_0 = W_0$

$eU_0 = h\frac{c}{\lambda} - W_0$

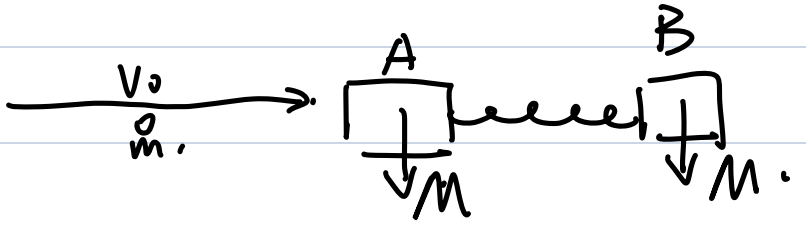
$U_0 = \frac{hc}{\lambda e} - \frac{W_0}{e}$

$= 1.24$

大题及.

动量与能量.

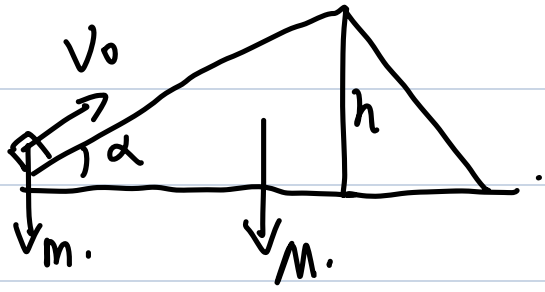
5.



$$\begin{cases} mv_0 = (2M+m)\cdot v_{共} \\ \frac{1}{2}mv_0^2 = \frac{1}{2}(2M+m)\cdot v_{共}^2 + \frac{1}{2}k\Delta x^2 \end{cases}$$

$$\Delta x = \sqrt{\frac{Mm^2v_0^2}{(M+m)(2M+m)\cdot k}}$$

6.

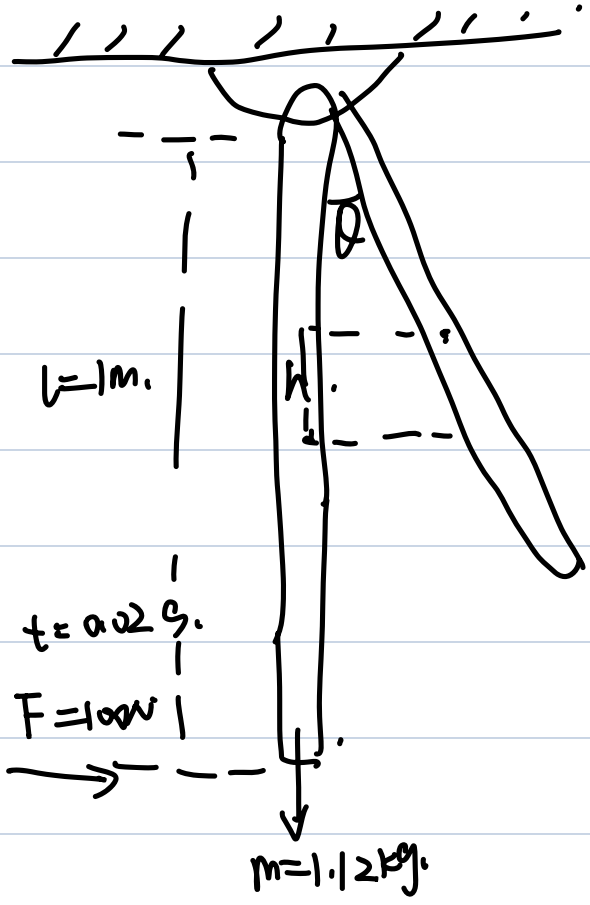


$$\begin{cases} mv_0\cos\alpha = (M+m)\cdot v_{共} \\ \frac{1}{2}mv_0^2 = mgh + \frac{1}{2}(M+m)\cdot v_{共}^2 \end{cases}$$

$$v_{共} = \sqrt{\frac{2(M+m)gh}{M+m\sin^2\alpha}}$$

刚体力学

3.



$J=\frac{ml^2}{3}$.

① $L=P\times R$.

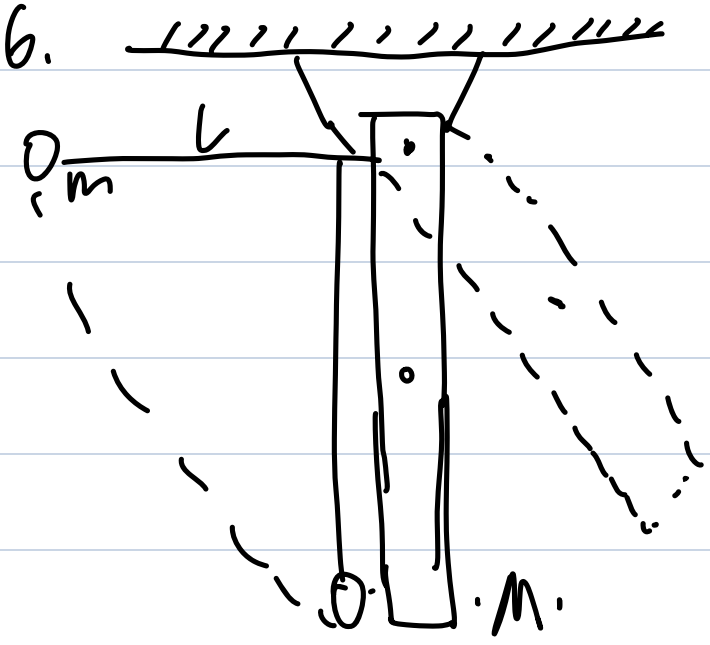
$=F\Delta t\times R$

$=100N\cdot 0.02\times 1=2\ kg\cdot s\cdot m=Jw_0$.

② $\frac{1}{2}Jw_0^2=\frac{1}{2}mgl(1-\cos\theta)$.

$\theta=88°38'$

6.



$P\times R$.

$J=\frac{1}{3}Ml^2$

① $mgl=\frac{1}{2}mv^2$.

$v=\sqrt{2gl}$.

② $L=mv\times l=Jw$.

$m\cdot\sqrt{2gl}\cdot l=\frac{1}{3}Ml^2\cdot w$

$3m = M$

① $\frac{1}{2}mv^2 = \frac{1}{2}Jw^2$.

$$\begin{cases} v = \sqrt{2gl} \\ v = w \cdot l \\ M = 3m \end{cases} \qquad w = \frac{\sqrt{2gl}}{l}$$

③ $\frac{1}{2}Jw^2 = \frac{1}{2}Mg(l - l\cos\theta)$

$\frac{1}{2} \times \frac{1}{3}M \cdot \frac{2gl}{l} = \frac{1}{2}Mg(l - l\cos\theta)$

$2mgl = 3mgl(1 - \cos\theta)$

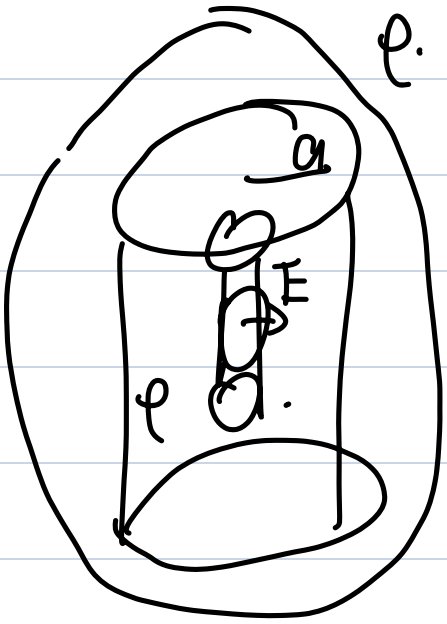
$\frac{2}{3} = 1 - \cos\theta$

$\cos\theta = \frac{1}{3}$

$\theta = \arccos\frac{1}{3}$

静电场.

3.



内:取L. $r \le a$.

$$E \cdot 2\pi r L = \frac{q_{内}}{\varepsilon_0} = \frac{\pi r^2 L \rho}{\varepsilon_0}$$

$$2\pi E r L = \frac{\pi r^2 L \rho}{\varepsilon_0}$$

$$E = \frac{r\rho}{2\varepsilon_0}$$

外 $$E \cdot 2\pi r L = \frac{\pi a^2 L \rho}{\varepsilon_0}$$

$$E = \frac{a^2 \rho}{2\varepsilon_0 r}$$

6.

$q = 1.6 \times 10^{-12} C$.

球外部.

$$E \cdot 4\pi R^2 = \frac{q}{\varepsilon_0}$$

$$E = \frac{q}{4\pi R^2 \varepsilon_0}$$

$$\int_0^{\rho} d\rho = \int_R^{\infty} E\, dR = \frac{q}{4\pi\varepsilon_0} \int_R^{\infty} \frac{1}{R^2} dR$$

$$\rho = \frac{-q}{4\pi\varepsilon_0} \frac{1}{R}\Big|_R^{\infty}$$

$$\rho_{表1} = \frac{q}{4\pi\varepsilon_0 R}$$

$$= 36V$$

② $$\rho_{表2} = 2\rho_{表1} = \frac{2q}{4\pi\varepsilon_0 \cdot 2R}$$

$$= 57V$$

电磁感应.

(1) $B = \mu_0 n I$. 螺线环B大小计算

$\Phi = BS = \mu_0 n I \cdot A$.

$M_{12} = M_{21}$ 同.

$\Phi = MI$.

$M = \frac{\Phi}{I} = \mu_0 n A$.

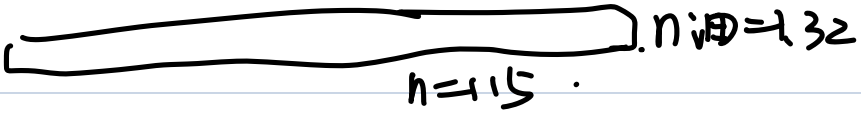
$\varepsilon = -\frac{d\Phi}{dt} = -M\frac{dI}{dt}$.

$= -MI_0 \cos\omega t$.

$= -\mu_0 n A I_0 \cos\omega t$.

$n = 1$

波动光学(1)-



2.

$$\begin{cases} \Delta x_1 = 2n油t = (2k_1+1)\cdot\frac{\lambda_1}{2} \\ \Delta x_2 = 2n油t = (2k_2+1)\cdot\frac{\lambda_2}{2} \end{cases}$$

$$k_2 = k_1 - 1$$

$$t = 643nm$$

量子物理.

红限 $h\nu = w_0$

3. $w = 2eV$

$h\nu = w_0$

$h\frac{c}{\lambda} = w_0$

$\frac{hc}{w_0} = \lambda$

$\lambda = \frac{6.63\times10^{-34}\times3\times10^{8}}{2\times1.6\times10^{-19}}$

$= 6.22\times10^{-9}\,m.$

$eU = h\nu - w_0$

$eU = h\frac{c}{\lambda} - w_0$

$eU + w_0 = h\frac{c}{\lambda}$

$\lambda = \frac{hc}{eU + w_0}$

$\lambda = \frac{6.63\times10^{-34}\times3\times10^{8}}{5\times1.6\times10^{-19}} = 2.48\times10^{-9}\,m.$

5. 康普顿散射 $\Delta\lambda = \lambda - \lambda_0 = \frac{h}{m_0 c}(1-\cos\theta) = \frac{2h}{m_0 c}\cdot\sin^2\frac{\theta}{2}$

$\lambda_C = 2.43\times10^{-12}$.

电子静质量 9.1×10^{-31}

① $\Delta\lambda = \lambda - \lambda_0 = \lambda_C(1-\cos\theta) = \lambda_C = 0.00243\,nm$.

② $\Delta\lambda$, λ_C.

$\lambda = \Delta\lambda + \lambda_0 = 0.0524\,nm$

① $\Delta\lambda = \lambda - \lambda_0 = \lambda_C(1-\cos\theta) = 2\lambda_C = 0.00486\,nm$

$\lambda = \Delta\lambda + \lambda_0 = 0.05486\,nm$