2012-2013 (A)

一. 选择题.

1. 由于试探电荷与带电体异号. q_0大 则带电体表面电荷密度变大

则 F/q_0 比 P点原先场强大 (A)

2. 根据电势叠加 各带电体单独存在, 在某点电势代数和.

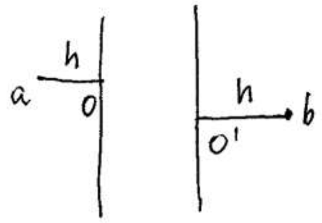
中心电荷在P点. $V_1=\frac{q}{4\pi\varepsilon_0 r}$

球面电荷单独存在. P点电势与中心点相同 ∴ $V_2=\frac{Q}{4\pi\varepsilon_0 R}$

∴ $V=V_1+V_2=\frac{q}{4\pi\varepsilon_0 r}+\frac{Q}{4\pi\varepsilon_0 R}$ (B)

3. $D=\sigma=\varepsilon E=\varepsilon_0\varepsilon_r E$. ∴ $\sigma=\varepsilon_0\varepsilon_r E$. (C)

4.



$V_0-V_a=E\cdot h=\frac{\sigma}{2\varepsilon_0}\cdot h$ —— (1)

$V_0'-V_b=E h=\frac{\sigma}{2\varepsilon_0}\cdot h$ —— (2)

$V_0=V_0'$ (导体) ∴ $V_a-V_b=0$. (2)-(1)

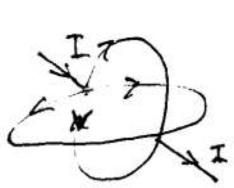
(D)

5. $\Phi_s+\Phi_{\pi r^2}=0$ ($\oint \vec{B}\cdot d\vec{S}=0$) ∴ $\Phi_s=-B\cdot\pi r^2\cos\alpha$ (A)

6. $F=F_{电}+F_{磁}=m\frac{v^2}{r}$ $F_{磁}=q\cdot v\cdot B$.

∴ $F\uparrow\to v\uparrow$ (B)

7.



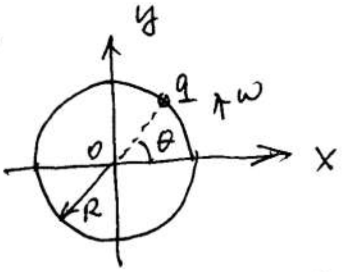
二直导线过 延长线过O点 B=0

二元电流分流 大小相等 方向相反 在中心点 B=0

∴ (C)

8. 和计算题三(8)相同. (D)

9.

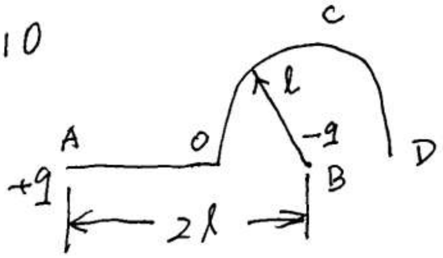


在O点t时刻.

$$\vec{D} = \frac{-q}{4\pi R^2}\cos\omega t\,\vec{i} - \frac{q}{4\pi R^2}\sin\omega t\,\vec{j}$$

$$\therefore \vec{j}_d = \frac{d\vec{D}}{dt} = \frac{q}{4\pi R^2}(\sin\omega t\,\vec{i} - \cos\omega t\,\vec{j}) \qquad (D)$$

10



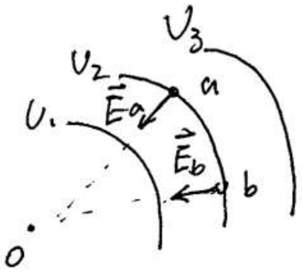
$A_电 = -\Delta E_p = W_D - W_O$.

$W = q \cdot V \qquad V_O = 0 \qquad \therefore W_O = 0$

$$A_电 = W_D = Q\cdot\left(\frac{q}{4\pi\varepsilon_0 3l} - \frac{q}{4\pi\varepsilon_0 l}\right)$$

$$= -Q\,\frac{q}{6\pi\varepsilon_0 l}$$

11.

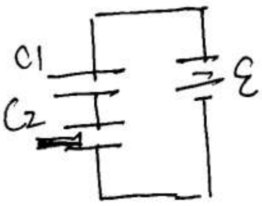


$U_1 < U_2 < U_3$

已知 $\therefore E_a = E_b$

12. $\frac{q_1 q_2}{4\pi\varepsilon_0 r_1^2} = \frac{q_1 q_2}{4\pi\varepsilon_0 \varepsilon_r r_2^2} \qquad \therefore \varepsilon_r = \left(\frac{r_1}{r_2}\right)^2$.

13. 保持电源连接. U



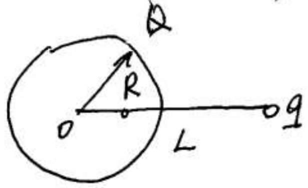
i) $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2'}$ 可知: $C\uparrow$

保持连接: $Q = CU$ 而串联 C_1 C_2 电量相等

$\therefore U_1 = \frac{Q}{C_1}$, $Q\uparrow$ $\therefore U_1\uparrow$ (增大)

ii) $Q = CU \qquad C\uparrow \rightarrow Q\uparrow$ 增大

14.



电荷球O点电势. $\frac{Q}{4\pi\varepsilon_0 R} + \frac{q}{4\pi\varepsilon_0 L}$

(感应电荷在中心点电势为0)

$\frac{R}{2}$处电势和O点相等 (导体等势体)

$$\frac{Q}{4\pi\varepsilon_0 R}+\frac{q}{4\pi\varepsilon_0 L}=V_{金}+\frac{q}{4\pi\varepsilon_0(L-\frac{R}{2})}$$

$$\therefore V_{金}=\frac{Q}{4\pi\varepsilon_0 R}+\frac{q}{4\pi\varepsilon_0 L}-\frac{q}{4\pi\varepsilon_0(L-\frac{R}{2})}$$

15 由 $\oint \vec{H}\cdot d\vec{l}=\Sigma I_0$

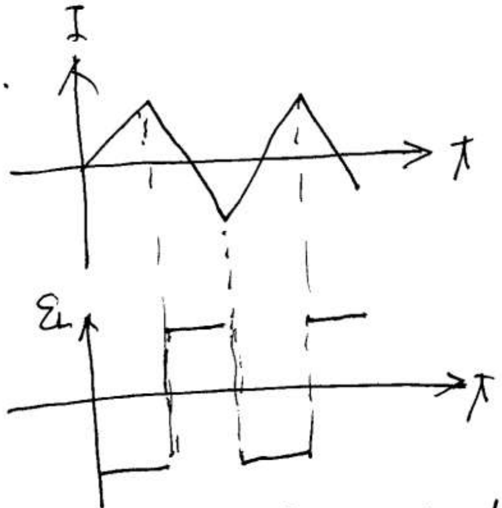
$\therefore H\cdot 2\pi r=I \qquad H=\frac{I}{2\pi r} \qquad B=\mu H=\frac{\mu I}{2\pi r}$.

16. 以 bcab 为正向. $\Phi=B\cdot\frac{1}{4}\pi R^2$

$\therefore \varepsilon_i=-\frac{d\Phi}{dt}=-\frac{1}{4}\pi R^2\frac{dB}{dt}=-\frac{1}{4}\pi R^2K$.

其大小为 $\frac{1}{4}\pi R^2K$ 其方向和逆时针相反 $c\to b$

17.



$\varepsilon_L=-L\frac{dI}{dt}$

18. $W=\frac{1}{2}LI^2 \qquad L=\mu_0\frac{N^2}{l}\cdot\pi R^2$

$\therefore \frac{W_1}{W_2}=\left(\frac{R_1}{R_2}\right)^2=\left(\frac{d_1}{d_2}\right)^2=\frac{1}{16}$

19. i) $\oint\vec{H}\cdot d\vec{l}=I_0+I_d$. 由于无传导电流 $I_0=0$

$\therefore \oint\vec{H}\cdot d\vec{l}=I_d=\frac{d\Phi_D}{dt}$

ii) $\oint\vec{E}\cdot d\vec{l}=-\frac{d\Phi_m}{dt}=-\iint\frac{\partial\vec{B}}{\partial t}\cdot d\vec{S}$.