

$$E = 1.7 \times 10^6 \text{ N/C}$$

$$d = 1.5 \times 10^{-2} \text{ m}$$

$$\Delta V = -(Ed) = -(1.7 \times 10^6 \times 1.5 \times 10^{-2})$$

$$= +2.6 \times 10^4 \text{ V}$$

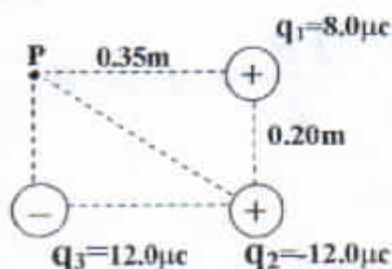
$$\Delta PE = -qEd$$

$$= -1 \times 10^6 \times 1.7 \times 10^6 \times (-1.5 \times 10^{-2})$$

$$\Delta PE = 2.55 \times 10^{-3} \text{ J}$$

تزداد طاقة الوضع الكهربائية للشحنة الموجبة

11- جهد النقطة (P)



$$V_P = V_1 + V_2 + V_3$$

$$= K_e \left(\frac{q_1}{r_1} + \frac{q_2}{r_2} + \frac{q_3}{r_3} \right)$$

$$= 9 \times 10^9 \left(\frac{8}{0.35} - \frac{12}{\sqrt{0.2^2 + 0.35^2}} - \frac{8}{0.20} \right) \times 10^{-6}$$

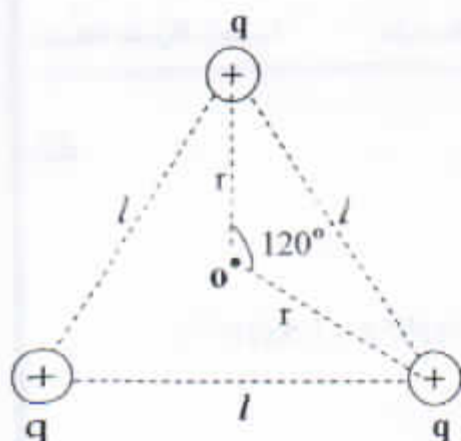
$$V_P = -42 \times 10^3 \text{ V}$$

طاقة الوضع للشحنة q_1 الموجبة نتيجة الشحنتين السالبتين .

$$PE = K_e \left(\frac{q_1 q_2}{r_{12}} + \frac{q_1 q_3}{r_{13}} \right)$$

$$= 9 \times 10^9 \left(\frac{(8) \times (-12)}{0.20} + \frac{8 \times (-8)}{\sqrt{0.35^2 + 0.2^2}} \right) \times 10^{-12}$$

$$PE = -5.76 \text{ J}$$



$$V_o = V_1 + V_2 + V_3$$

$$V_1 = V_2 = V_3$$

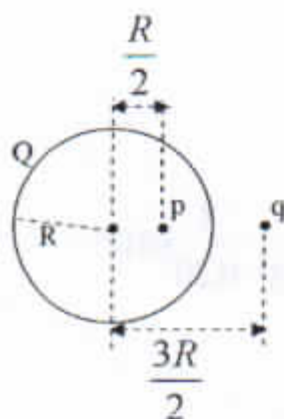
$$V_o = 3V = \frac{3K_c q}{r}$$

$$= \frac{3K_c q}{\frac{l}{\sqrt{3}}} = 3\sqrt{3} \frac{K_c q}{l}$$

$$l^2 = r^2 + r^2 - 2r^2 \cos 120$$

$$l^2 = 2r^2 - 2r^2 \left(-\frac{1}{2}\right)$$

$$l^2 = 3r^2 \Rightarrow r = \frac{l}{\sqrt{3}}$$



$$V_q = \frac{KQ}{r} \quad \frac{3R}{2} = r > R$$

$$= \frac{KQ}{\frac{3R}{2}} = \frac{2KQ}{3R}$$

$$V_p = \frac{KQ}{R} \quad \frac{R}{2} = r < R$$

$$V_p - V_q = \frac{Kq}{R} - \frac{2Kq}{3R}$$

$$V_p - V_q = \frac{Kq}{R} \left(1 - \frac{2}{3}\right)$$

$$= \frac{Kq}{3R}$$

$$V_q - V_p = \frac{-Kq}{3R}$$

$$C = 6.0 \text{ PF}$$

$$\Delta V = 12.0 \text{ V}$$

شحنة المكثف هي القيمة المطلقة لشحنة احد لوحيه

$$Q = C \Delta V$$

$$= 6.0 \times 10^{-12} \times 12.0$$

$$Q = 7.2 \times 10^{-11} \text{ C}$$

بالتالي فإن شحنة احد لوحيه تكون $+7.2 \times 10^{-11} \text{ C}$ والاخرى $-7.2 \times 10^{-11} \text{ C}$

-22

$$E = 3 \times 10^6 \text{ V / m}$$

$$d = 10 \text{ mm} = 10 \times 10^{-3} \text{ m}$$

$$\Delta V = ?$$

$$\Delta V = Ed = 3 \times 10^6 \times 10 \times 10^{-3} \text{ m}$$

$$= 3 \times 10^4 \text{ V}$$

-23

$$C = 6 \mu \text{ f}$$

$$Q = 10^{-6} \text{ C}$$

$$U = ?$$

$$U = \frac{1}{2} \frac{Q^2}{C}$$

$$= \frac{1}{2} \times \frac{(10^{-6})^2}{6 \times 10^{-6}}$$

$$U = 8.3 \times 10^{-8} \text{ J}$$

$$W = - \Delta PE$$

$$W = qEd$$

$$d = \frac{W}{qE}$$

-24

-25

الجهد الكهربائي للشحنة النقطية عند نقطة
شدة المجال الكهربائي للشحنة النقطية عند نفس النقطة

$$V_p = 600.0 \text{ V}$$

$$E_p = 200.0 \text{ N / C}$$

$$V_p = \frac{Kq}{r} = 600$$

$$r = ?$$

$$q = ?$$

$$E = \frac{Kq}{r^2} = 200$$

$$\frac{\frac{Kq}{r}}{\frac{Kq}{r^2}} = \frac{600}{200}$$

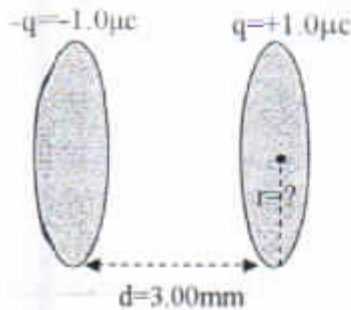
$$r = 3 \text{ m}$$

(ب)

وهي موجبة لأن الجهد موجب

$$600.0 = \frac{qx \cdot 10^{-9} \times q}{3.000}$$

$$q = 2 \times 10^{-7} \text{ C}$$



$$E = 3.0 \times 10^6 \text{ N / C}$$

$$r = ?$$

$$Q = 1.0 \mu\text{C}$$

$$\Delta V = Ed$$

$$= 3.0 \times 10^6 \times 3.0 \times 10^{-3}$$

$$9.0 \times 10^3 \text{ V}$$

$$C = \frac{Q}{\Delta V} = \frac{1 \times 10^{-6}}{9 \times 10^3}$$

$$= 1.11 \times 10^{-10} \text{ f}$$

$$C = \frac{\epsilon_0 A}{d}$$

$$A = \frac{Cd}{\epsilon_0} =$$

$$= \frac{1.11 \times 10^{-10} \times 3.00 \times 10^{-3}}{8.85 \times 10^{-12}}$$

$$= 0.0376 \text{ m}^2$$

$$A = \pi r^2$$

$$r = \sqrt{\frac{A}{\pi}}$$

$$= 0.11 \text{ m}$$

$$r = 11 \text{ cm}$$

-26

$$V_o = K_c \left(\frac{q_1}{r_{1o}} + \frac{q_2}{r_{2o}} \right) = K_c \left(\frac{q}{l} + \frac{-q}{l} \right) = 0$$

$$V_A = K_c \left(\frac{q_1}{r_{1A}} + \frac{q_2}{r_{2A}} \right) = K_c \left(\frac{q}{4l} + \frac{-q}{2l} \right)$$

$$V_A = \frac{K_c q}{l} \left(\frac{1}{4} - \frac{1}{2} \right) = \frac{-K_c q}{4l}$$

$$\Delta PE_{o \rightarrow A} = Q(V_A - V_o)$$

$$= Q \left(\frac{-K_c q}{4l} \right)$$

$$\Delta PE_{o \rightarrow A} = \frac{-K_c q Q}{4l}$$

$$A = 5.00 \text{ cm}^2$$

$$= 5.00 \times 10^{-4} \text{ m}^2$$

$$d = 1.00 \text{ mm} = 1.00 \times 10^{-3} \text{ m}$$

$$Q = 400.0 \text{ pC}$$

$$C = \frac{\epsilon_o A}{d} = \frac{8.85 \times 10^{-12} \times 5.00 \times 10^{-4}}{1.00 \times 10^{-3}}$$

$$= 4.425 \times 10^{-12} \text{ F}$$

$$\Delta V = \frac{Q}{C} = \frac{400.0 \times 10^{-12}}{4.425 \times 10^{-12}}$$

$$\Delta V = 90.4 \text{ V}$$

$$E = \frac{\Delta V}{d} = \frac{90.4}{1.00 \times 10^{-3}}$$

$$E = 9.04 \times 10^4 \text{ V/m}$$

(6)



$$V_a - V_b = \Delta V_{ab} = 25700 \text{ V} \quad -29$$

$$\Delta V_{ba} = -25700 \text{ V}$$

$$\Delta KE + \Delta PE = 0$$

$$\Delta KE = -\Delta PE$$

$$= -(q_p \Delta V_{ba})$$

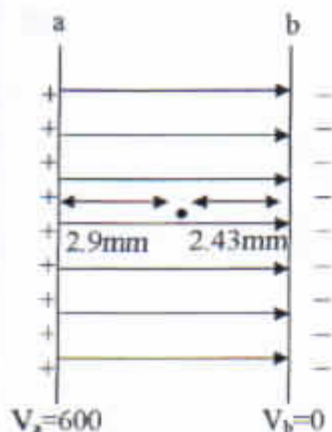
$$\Delta KE = 1.6 \times 10^{-19} \times 25700$$

$$KE_f - KE_i = 4.11 \times 10^{-15} \text{ J}$$

$$KE_f = \frac{1}{2} m_p V_f^2$$

$$= \frac{1}{2} (1.67 \times 10^{-27}) (V_f^2)$$

$$V_f = 2.22 \times 10^6 \text{ m/s}$$



-30

$$d = 5.33 \times 10^{-3} \text{ m}$$

$$\Delta V = 600 \text{ V}$$

$$E = ?$$

$$F = ?$$

$$PE = ?$$

$$E = \frac{\Delta V}{d} = \frac{600}{5.33 \times 10^{-3}}$$

$$E = 1.13 \times 10^5 \text{ N/C}$$

الحل

$$F = qE$$

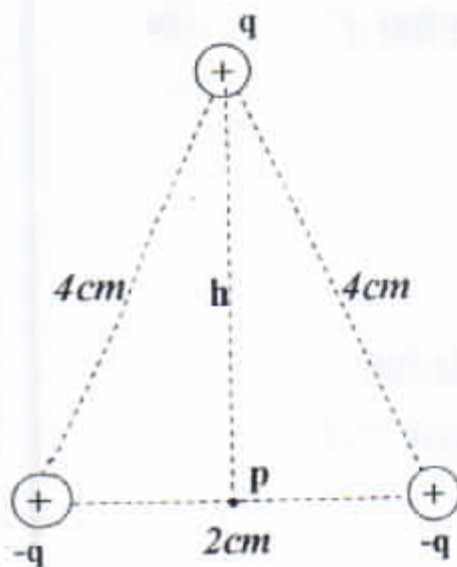
$$= 1.6 \times 10^{-19} \times 1.13 \times 10^5 = 1.80 \times 10^{-14} \text{ N}$$

$$PE = -qEd$$

$$= -(-1.6 \times 10^{-19})(1.13 \times 10^5)(-2.43 \times 10^{-3})$$

$$PE = -4.39 \times 10^{-17} \text{ J}$$

(7)



$$q = 5.0 \times 10^{-9} \text{ C}$$

$$V_p = ?$$

$$h = (\sqrt{4.0^2 - 1.0^2}) \times 10^{-2}$$

$$= \sqrt{15} \times 10^{-2} \text{ cm} = 3.87 \times 10^{-2} \text{ cm}$$

$$V_p = V_1 + V_2 + V_3$$

$$K_e \left(\frac{q_1}{r_1} + \frac{q_2}{r_2} + \frac{q_3}{r_3} \right)$$

$$= 9 \times 10^9 (5.0 \times 10^{-9}) \left(\frac{1}{h} - \frac{1}{0.01} - \frac{1}{0.01} \right)$$

$$V_p = -7.84 \times 10^3 \text{ V}$$

-31

-32

$$Q_1 = Q_2 = Q$$

$$V_p = V_{1(n)} + V_{2(m)}$$

$$= K \frac{Q_{1n}}{R} + K \frac{Q_{2m}}{r}$$

$$= KQ \left[\frac{1}{R} + \frac{1}{r} \right]$$

$$= 9 \times 10^9 \times \left[\frac{1}{5 \times 10^{-2}} + \frac{1}{50 \times 10^{-2}} \right] \times 10^{-5}$$

$$V_p = 2 \times 10^6 \text{ V}$$

ب- عند منتصف المسافة

$$V_A = V_{1n} + V_{2m}$$

$$V_{1n} = V_{2m} = V$$

$$V_A = 2V = 2\left(\frac{kQ}{r}\right)$$

$$= \frac{2 \times 9 \times 10^9 \times 10^{-5}}{25 \times 10^{-2}}$$

$$V_A = 7.2 \times 10^5 V$$

$$C = 3750 \times 10^{-12} F$$

$$Q = 1.75 \times 10^{-8} C$$

$$\Delta V = \frac{Q}{C} = \frac{1.75 \times 10^{-8}}{3750 \times 10^{-12}}$$
$$= 4.67 V$$

$$\Delta V = Ed$$

$$E = \frac{\Delta V}{d}$$

$$= \frac{4.67}{6.5 \times 10^{-4}}$$

$$\Delta V = 7.2 \times 10^3 V/m$$