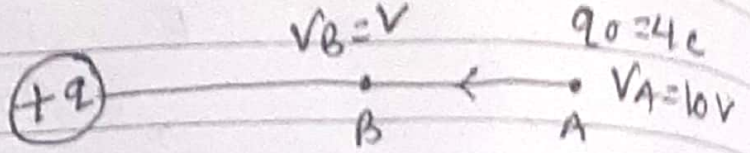
Q. If 20 J of work has to be done to move an electric charge of 4c from a point, where potential is 10V to another point where potential is V volt. Find the value of V.



Sol^n:-

Given, $V_A = 10V$

$V_B = V$

$W_{AB} = 20\ J.$

$q_0 = 4c.$

$W_{AB} = 20\ J.$

$V_{AB} = V_B - V_A$

$W_{AB} = W_B - W_A.$

$$V_{AB} = \frac{W_{AB}}{q_0}$$

$$\text{or, } V_B - V_A = \frac{20}{4}$$

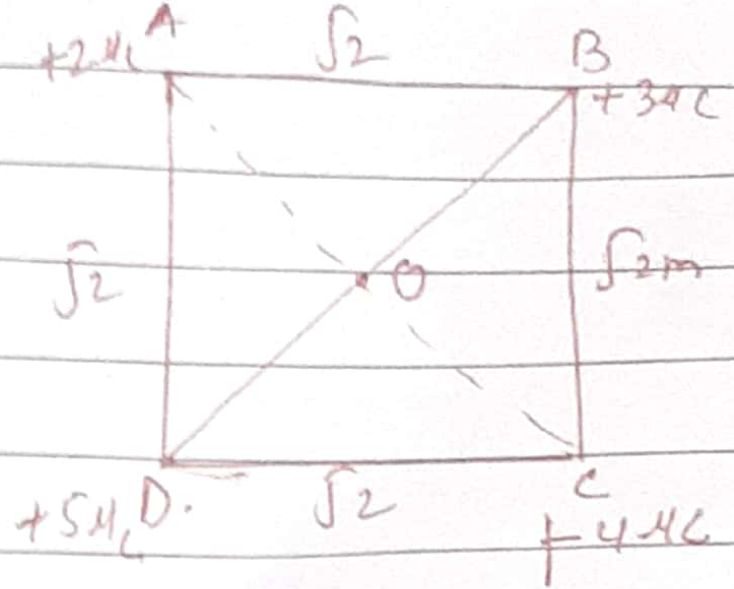
$$\text{or, } V - 10 = 5$$

$$\text{or, } V = 5 + 10$$

$$\therefore V = 15 \text{ volt.}$$

Q. charges of +2μC, +3μC, −4μC and +5μC are placed at the corners of Square having each side $\sqrt{2}$m find the potential at the centre of Square.

Sol^n.



In $\triangle BCD$,

$(BD)^2 = (BC)^2 + (CD)^2$

or, $BD^2 = (\sqrt{2})^2 + (\sqrt{2})^2$

$= 2+2$

$BD = \sqrt{4}$

$\therefore BD = 2m$

Similarly, $AC = 2m$

$OA = OC = OB = OD = 1m$

We know, $V = \frac{q}{4\pi\epsilon_0 r}$

$$V_A = \frac{2\times10^{-6}}{4\pi\epsilon_0(0A)}$$

$$= 2\times10^{-6}\times9\times10^{9}$$

$$= 2\times9\times10^{3}$$

$$V_B = 3\times10^{-6}\times9\times10^{9}$$

$$= 3\times9\times10^{3}$$

$$V_C = +4\times10^{-6}\times9\times10^{9}$$

$$= +4\times9\times10^{3}$$

$$V_D = 5\times10^{-6}\times9\times10^{9}$$

$$= 5\times9\times10^{3}$$

$$V_{net} = V_A + V_B + V_C + V_D$$

$$= 9\times10^{3}[2+3+4+5]$$

$$= 9\times10^{3}\times14$$

$$= 126\times10^{3}\ V$$