1.

$\Delta U = q\Delta V$

$500 = 40\Delta V$

$\Delta V = 12.5V$

A #

2.

$U_R = 2\frac{kQQ}{d} = U_T$

$W = U_T - U_R = 0$

A #

3.

$V = -7.5x^2 + 3x$

$U = qV$

$\Rightarrow U = -7.5x^2q + 3xq$

$\therefore U$ only related to x

$\Rightarrow$ planes parallel to the yz plane

B #

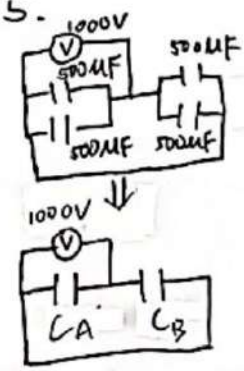
4.

$q = CV, C = \frac{\varepsilon_0 A}{d}, V = Ed$

$\Rightarrow q = \frac{8.85\times10^{-12}\times 0.2}{10^{-4}} \times 2\times10^{6}\times10^{-4}$

$= 3.54\times10^{-6}C$ A #

5.



$C_A = C_B = 500+500 = 1000\mu F = 1mF$

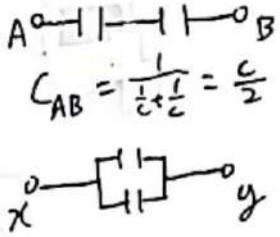
$q = CV$

$\therefore q_{CA} = 0.001\times1000 = 1$

$\Rightarrow q$ on each capacitor $= 1\div2 = 0.5C$

B #

6.



$C_{AB} = \frac{1}{\frac{1}{C}+\frac{1}{C}} = \frac{C}{2}$

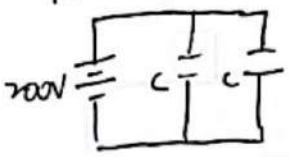
$C_{xy} = C+C = 2C$

$C_{AB} = kC_{xy}$

$k = \frac{1}{4}$

D #

7.



total 0.04J

$\therefore$ each 0.02J

$U = \frac{1}{2}CV^2$

$\Rightarrow 0.02 = \frac{1}{2}C\cdot200^2$

$C = 1\times10^{-6}F = 1\mu F$

B #

8.

$C_0 = \frac{A\varepsilon_0}{d}$

$C = \frac{A\varepsilon}{2d}$

$\varepsilon = k\varepsilon_0$

$\frac{C}{C_0} = \frac{2pF}{1pF} = \frac{k}{2}$

$\Rightarrow k = 4$

D #