

$$1. K = 9 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2$$

$$q = 2.0 \times 10^{-6} \text{ C}$$

$$a = 10 \text{ cm} = .10 \text{ m}$$

$$x = 5 \text{ cm} = .05 \text{ m}$$

$$E = \frac{Kq}{(a+x)^2}$$

$$= \frac{(9 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2)(2.0 \times 10^{-6} \text{ C})}{(.10 \text{ m} + .05 \text{ m})^2}$$

$$= \boxed{8.0 \times 10^5 \text{ N/C}}$$

$$2. \sigma_A = -1.0 \times 10^{-6} \text{ C}$$

$$\sigma_B = +2.0 \times 10^{-6} \text{ C}$$

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N} \cdot \text{m}^2$$

$$E = \frac{|\sigma_A|}{2\epsilon_0} + \frac{|\sigma_B|}{2\epsilon_0}$$

$$= \frac{1}{2\epsilon_0} \times (|\sigma_A| + |\sigma_B|)$$

$$= \frac{1}{2 \times 8.85 \times 10^{-12} \text{ N/C}} \times (1 \times 10^{-6} \text{ C} + 2 \times 10^{-6} \text{ C})$$

$$= \boxed{1.69 \times 10^5 \text{ N/C}}$$

$$3. q = 1.0 \times 10^{-6} \text{ C}$$

$$A = 2.0 \text{ m}^2$$

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N} \cdot \text{m}^2$$

$$E = \frac{q}{A \cdot \epsilon_0}$$

$$= \frac{1.0 \times 10^{-6} \text{ C}}{2.0 \text{ m}^2 \times 8.85 \times 10^{-12} \text{ C}^2/\text{N} \cdot \text{m}^2}$$

$$= \boxed{5.64 \times 10^4 \text{ N/C}}$$