*Chapter **17*** *(Bueche & Jerde)* ***Electrical Potential***

P03 (**a**) $E = \Delta V/d = 1.50/6.00\times10^{-4} = 2.50\times10^{3}$ (V/m); (**b**) $F = qE = (-1.60\times10^{-19})(2.50\times10^{3}) = -4.00\times10^{-16}$ (N).

P04 (**a**) $\Delta V = Ed = (3000)(3.00\times10^{-4}) = 0.900$ (V); (**b**) $F = qE = 4.80\times10^{-16}$ (N).

P10 $E_x = -500$V/m & $v_0 = 6.0\times10^{6}$ m/s: (**a**) $\Delta K = -\Delta U$, $(½)m(v^2 - v_0^2) = -q\Delta V = -e\,E_x$, $v^2 = v_0^2 - 2eE_x/m = 7.26\times10^{10}$, $v = 2.68\times10^{5}$ (m/s); (**b**) $\Delta t = \Delta x/\langle v\rangle = 2\Delta x/(v + v_0) = 6.91\times10^{-6}$ (s).

P15 $(½)m_p(v^2 - v_0^2) = \pm eV$ gives $v = (v_0^2 \pm 2eV/m_p)^{1/2}$, depending the polarities of the plates.

P22 $\Delta K = K_f - K_i = -\Delta U = -q\Delta V$: (**a**) $K_f = 100-80 = 20$ (eV); (**b**) $K_f = 100+80 = 180$ (eV).

P26 $K_0 = 4800$ eV & $\Delta V = 2000$ V: (**a**) $\Delta K = -q\Delta V = -2000$ eV; (**b**) $K = K_0 + \Delta K = 4800 - 2000 = 2800$ (eV); (**c**) $K = K_0 + \Delta K = 4800 - (2)(2000) = 800$ (eV).

P33 $V/k = q_1/r_1 + q_2/r_2$, $V/k = (-4.00\times10^{-9}) / |x| + (6.0\times10.9)/|x-2.40| = 0$, $2.00|2.40-x| = 3.00|x|$. Square it, we have $5x^2 + 19.2x - 23.04 = 0$, $x = 0.96$ m or $x = -4.80$ m .

P36 $V = kq/R = (9.00\times10^{9})(8.00\times10^{-9})/(0.300) = 2.40$ (V) .

P41 $A = 280$ cm^2, $d = 0.5$ mm & $q = 1.0\ \mu$C: $C = \varepsilon_0 A/d = 0.4956\times10^{-9}$ F, $E = V/d = q/dC = 4.03\times10^{6}$ V/m .

P43 (**a**) $A = 360$ cm^2, $d = 0.05$ mm, $C_v = \varepsilon_0 A/d = 6.37\times10^{-9}$ F; (**b**) $V = 9.0$ V, $q_v = C_vV = 57.3\times10^{-9}$ C .

P46 $C_a = \kappa\varepsilon_0 A/d = q/V$ & $E = V/d$ give $q = \kappa\varepsilon_0 AE = 80.1$ (nC).

P47 $q_d = C_dV_0 = \kappa C_0V_0 = \kappa q_0$, $\kappa = q_d/q_0 = 84/28 = 3.0$.

P55 (**a**) $C_p = 12$ pF, $C_{eq}^{-1} = 1/8 + 1/12 + 1/8 = 1/3$, $C_{eq} = 3.00$ pF; (**b**) $q = C_{eq}V = 36.0$ pC, $q_8 = q_p = 36.0$ pC, $q_6 = 18.0$ pC. $V_8 = q/C_8 = 4.50$ V, $V_6 = q/C_p = 3.00$ V .

P57 $d_2 = 2d_1$ & $q_1 = q_2$. $EG_1 = q_1^2/2C_1$ & $EG_2 = q_2^2/2C_2$ gives $EG_2/EG_1 = C_1/C_2 = d_2/d_1 = 2.00$.

P58 $EG = (½)CV^2$, $EG_8 = 8.10\times10^{-11}$ J, $EG_6 = 2.70\times10^{-11}$ J .

P62 $v_0 = 4\times10^{4}$ m/s and $\theta_0 = 30°$. We are only concerned with the vertical component of the velocity because there are no horizontal forces acting. Thus, $(½)m_p(v_0\sin\theta_0)^2 = eV$, $V = m_p(v_0\sin\theta_0)^2/2e = 2.09$ V .

P64 $\Delta K = -q\Delta V$ or $(½)m_e(v_c^2 - v_a^2) = e(V_c - V_a)$, $v_c = 4.79\times10^{6}$ m/s .

P69 $C_1 = 1.0\ \mu$F, $C_2 = 3.0\ \mu$F, and V = 12 V. $q_0 = CV = 12.0\ \mu$C. After connecting, $V_1 = V_2 = $ V , $q_1 = C_1V$ & $q_2 = C_2V$. $q_0 = q_1 + q_2 = (C_1 + C_2)$V , $V = q_0/(C_1+C_2) = 3.00$ V, $q_1 = 3.00\ \mu$C & $q_2 = 9.00\ \mu$C .

P70 $C_A = 40$ pF & $C_B = 36$ pF: (**a**) $V_A = 9.0$ V, $q_A = C_A V_A = 360$ pC; (**b**) $q_B = q_A$, $V_B = q_B/C_B = 10.0$ V; (**c**) $EG = (½)CV^2$, $EG_B - EG_A = 1.8\times10^{-9} - 1.62\times10^{-9} = 1.80\times10^{-10}$ (J); (**d**) $W_{ex} \geq \Delta EG = 1.80\times10^{-10}$ J .

P72 The net force downward is $F = mg + qE = mg'$. Thus, $f = (g/L)^{1/2}/2\pi = [(mg+qE)/mL]^{1/2} / 2\pi$.