Physics 1214, Homework #2: solutions

Answers to multiple choice questions: M1: (a) A, (b) C; M2: (a) C, (b) B.

P1: $W = 8 \times 10^{-5}$ J

P2: $V = k \left(\dfrac{Q_1}{r_1} + \dfrac{Q_2}{r_2} + \dfrac{Q_3}{r_3} + \dfrac{Q_4}{r_4} \right) = (9 \times 10^9) \dfrac{(1 + 2 + 3 + 4) \times 10^{-6}}{0.01(1/\sqrt{2})} = 1.27 \times 10^7$ V

P3: $V_a = k \left(\dfrac{q_1}{r} + \dfrac{q_2}{r\sqrt{2}} \right) \qquad V_b = k \left(\dfrac{q_1}{r\sqrt{2}} + \dfrac{q_2}{r} \right)$

$V_a - V_b = k \dfrac{q_1 - q_2}{r} \left(1 - \dfrac{1}{\sqrt{2}} \right) = -79$ kV

P4: $C = \varepsilon_0 \dfrac{A}{d} = (8.85 \times 10^{-12}) \dfrac{(0.05)^2}{0.001} = 22$ pF $\qquad U = \dfrac{CV^2}{2} = 2.8 \times 10^{-8}$ J