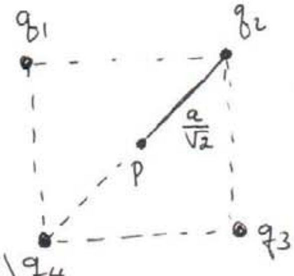
KING FAHD UNIVERSITY OF PERTOLEUM & MINERALS
PHYSICS DEPARTMENT
QUIZ #8 - CHAPTER 24

NAME: Key ID# SECTION#

Consider 4 charges q1 = – 2 μC, q2 = +4 μC, q3 = – 10 μC, and q4 = – 20 μC at the corner of a square of side a = 10 cm. Calculate the electric potential at the center of the square.



$$V_p = V_1 + V_2 + V_3 + V_4$$

$$= \frac{kq_1}{a/\sqrt{2}} + \frac{kq_2}{a/\sqrt{2}} + \frac{kq_3}{a/\sqrt{2}} + \frac{kq_4}{a/\sqrt{2}}$$

$$V_p = \frac{9\times10^9}{\frac{0.1}{\sqrt{2}}}\left(-2\times10^{-6} + 4\times10^{-6} - 10\times10^{-6} - 20\times10^{-6}\right)$$

$$\boxed{V_p = -3.56\times10^{6}\ V}$$

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The electric potential at points in the xy–plane is given by $V = x^3 - 2xy - 4xyz^3$ V, where x, y and z are in meters. Calculate the magnitude of the electric field at the point with the coordinates x = 1 m, y = 2 m and z = 4.

$$E_x = -\frac{\partial V}{\partial x} = -\left(3x^2 - 2y - 4yz^3\right)$$

$$E_y = -\frac{\partial V}{\partial y} = -\left(-2x - 4xz^3\right)$$

$$E_z = -\frac{\partial V}{\partial z} = -\left(-12xyz^2\right)$$

at (1, 2, 4)

$$E_x = -(3 - 4 - 512) = 513 \ \frac{N}{C}$$

$$E_y = -(-2 - 256) = 258 \ \frac{N}{C}$$

$$E_z = -(-384) = 384 \ \frac{N}{C}$$

$$\vec{E}_{net} = (513\,\hat{i} + 258\,\hat{j} + 384\,\hat{k}) \ \frac{N}{C}$$

magnitude: $E_{net} = \sqrt{513^2 + 258^2 + 384^2} = \boxed{691 \ \frac{N}{C}}$

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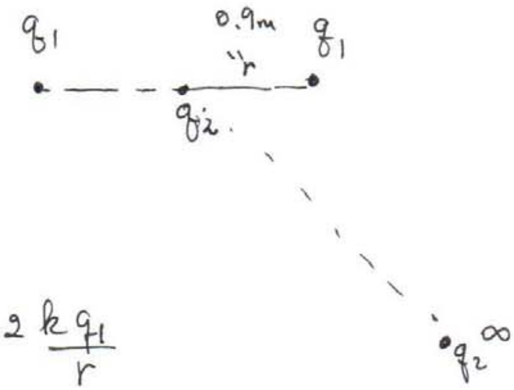
PHYSICS DEPARTMENT
QUIZ #7- CHAPTER 24

NAME: Key ID# SECTION#

Two equal charges, each of 0.12 μC, are separated by a distance of 1.8 m. Calculate the work done by an external agent to bring a charge of 0.15 μC from infinity to the midpoint between the two charges?



$$W_{app} = q_2(\Delta V)$$

$$= q_2(V_f - V_i) \quad (V_i \to 0)$$

$$V_f = \frac{kq_1}{r} + \frac{kq_1}{r} = \frac{2kq_1}{r}$$

$$W_{app} = q_2\left(\frac{2kq_1}{r}\right) = \frac{2kq_1q_2}{r}$$

$$= \frac{2 \times 9\times10^{9} \times 0.12\times10^{-6} \times 0.15\times10^{-6}}{0.9}$$

$$\boxed{W_{app} = 3.6\times10^{-4}\ J}$$