SEM-2

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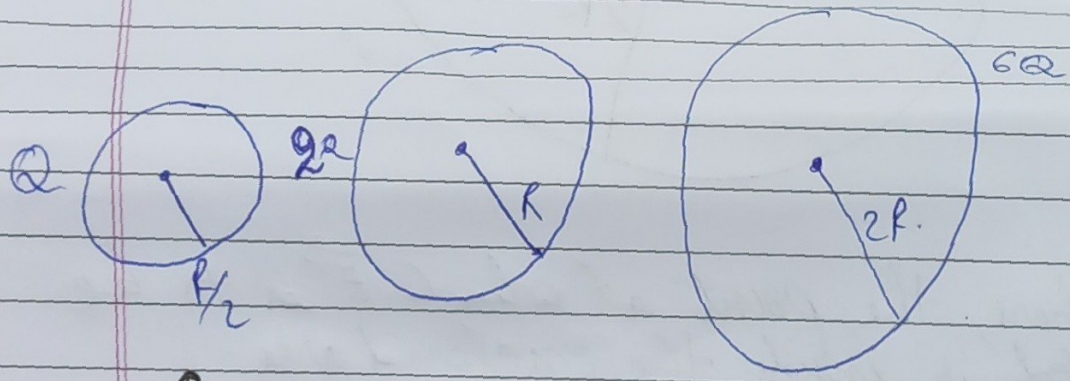
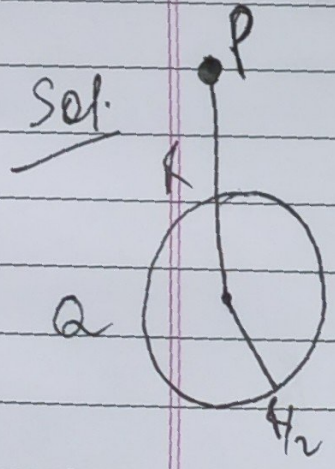
Physics Presentation

Q There are 3 dielectric solid spheres with charges 2Q, 6Q & Q upon them respectively. Radii of spheres are R, 2R, 2R. Find $\vec{E}$ at a point 'P' distant 6R from centre of Sphere and compare the values.



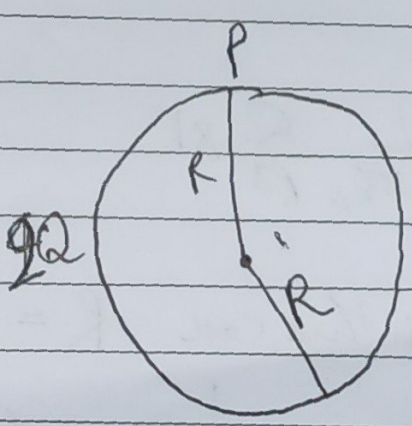
Sol:



Here, ∵ the point @ which $\vec{E}$ is to be calculated is outside the enclosed area

$$\vec{E_1} = \frac{1}{4\pi\epsilon_0}\frac{q}{r^2}$$

$$\vec{E_1} = \frac{1}{4\pi\epsilon_0}\frac{Q}{R}$$



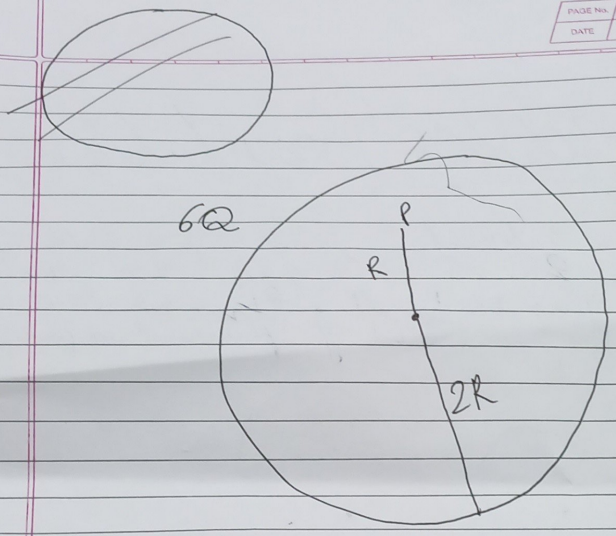
r :- dist of Ptical

Here, point @ which $\vec{E}$ is to be calculated is on surface,

$r = R$

$$E_2 = \frac{1}{4\pi\epsilon_0}\cdot\frac{2Q}{R}$$

$$= \frac{1}{2\pi\epsilon_0}\frac{Q}{R}$$



here, the point at which $\vec{E}$ is to be calculated is inside the enclosed area.

Hence, $$\vec{E} = \frac{1}{4\pi\epsilon_0} \frac{Q}{R^3} \times r$$

in this case $R = 2R$ & $r = R$

so, $$\vec{E} = \frac{1}{4\pi\epsilon_0} \frac{6Q}{8R^3} \times R$$

$$\vec{E} = \frac{1}{4\pi\epsilon_0} \frac{3Q}{4R}$$

$$\vec{E} = \frac{3}{4} \frac{1}{4\pi\epsilon_0} \frac{Q}{R}$$

hence, $E_1 > E_3 > E_2$

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