

348.

Problem 30.29 (RHK)

An electric field of approximately 100 V m^{-1} is often observed near the surface of the Earth. We may assume that this field is the same over the entire surface. We have to calculate the electric potential of a point on the surface.

Solution:

Earth is a sphere of radius $R = 6.37 \times 10^6 \text{ m}$. If the electric field is approximately uniform near the surface of the Earth, we may say that it is equivalent to the field produced by an amount of charge Q at the centre of the Earth.

That is

$$E = \frac{Q}{4\pi\epsilon_0 R^2} = 100 \text{ V m}^{-1}.$$

Electric potential of a point on the surface of the Earth will therefore be equal to

$$V = \frac{Q}{4\pi\epsilon_0 R} = ER = 100 \times 6.37 \times 10^6 \text{ V} = 637 \text{ MV}.$$

