

NCERT/CBSE PHYSICS CLASS 12 textbook

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Answers to NCERT/CBSE PHYSICS Class 12(Class XII)textbook Exercise and Additional exercise

CHAPTER TWO

ELECTRIC POTENTIAL AND CAPACITANCE

EXERCISES

(For simplicity in numerical calculations, take $g = 10 \text{ m s}^{-2}$)

2.15 A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q .

(a) A charge q is placed at the centre of the shell. What is the surface charge density on the inner and outer surfaces of the shell?

(b) Is the electric field inside a cavity (with no charge) zero, even if the shell is not spherical, but has any irregular shape? Explain.

2.15

Key Idea

Change on a conductor resides on the surface of the conductor. Charges placed a hollow conductor induces on the conductor.

Solution

- a) Charge on outer surface of shell is Q . On placing q inside the shell, charges $-q$ and $+q$ appear on the inner and outer surface s of the shell. Total charge on inner surface of shell is $-q$.

$$\text{Hence charge density} = \frac{-q}{4\pi r_1^2}$$

Total charge on outer surface of shell is $q + q$

$$\text{Hence charge density} = \frac{Q + q}{4\pi r_2^2}$$

- b) Even if shell has irregular shape, field inside it is zero. Since no charges are present inside, using Gauss's law we can say that $\Phi = 0$ which means field is zero.

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