Answer on Question 51718, Physics, Electromagnetism

1. The electric potential difference between two points A and B is $42V$. What is the work done by an external agent in carrying a charge of $5.0 \cdot 10^{-5} C$ from A to B at constant speed?

a) $2.1 \cdot 10^{-3} J$

b) $8.4 \cdot 10^{-4} J$

c) $2.1 \cdot 10^{-4} J$

d) $8.4 \cdot 10^{-3} J$

Solution:

From the definition of electric potential difference we have:

$$V_B - V_A = \frac{W_{ext}(A \to B)}{q_0},$$

where, $V_B - V_A$ is the electric potential difference between two points A and B, $W_{ext}(A \to B)$ is the external work needed to take the charge q_0 from A to B at constant speed.

Thus, the work done by an external agent in carrying a charge of $5.0 \cdot 10^{-5} C$ from A to B at constant speed will be:

$$W_{ext}(A \to B) = (V_B - V_A)q_0 = 42V \cdot 5.0 \cdot 10^{-5} C = 2.1 \cdot 10^{-3} J.$$

Answer: a) $2.1 \cdot 10^{-3} J$.

2. From Gauss' law which of the following is not correct:

a) The outward flux of electric field through an enclosed surface is proportional to the electric charges enclosed.

b) The field at a point outside a spherically symmetric charge is the same as the electric field at the same point due to a point charge at its centre.

c) The electric flux through a Gaussian surface is a vector product of the electric field and a unit vector perpendicular to and outward from the surface.

d) The total electric flux through a cylinder placed in an electric field with its axis parallel to the field is zero.

Answer:

The Gauss' law states that the total flux of the electric current through a closed surface is proportional to the total charge inside the surface. Thus, the incorrect statement is a) The outward flux of electric field through an enclosed surface is proportional to the electric charges enclosed.