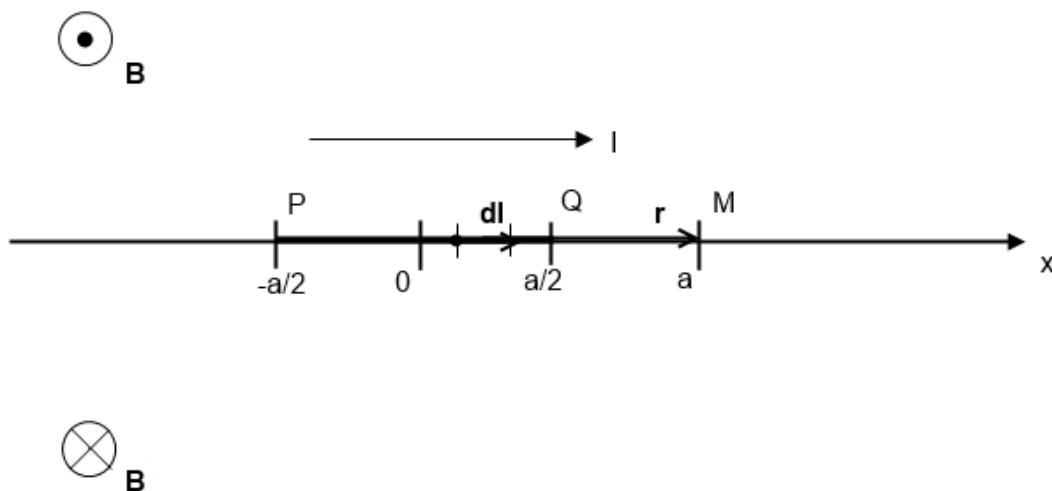## Answer on Question #41094 - Physics - Electromagnetism

A straight section PQ of a circuit lies along the X-axis from x = a/2 to –a/2 and carries a steady current I. The magnetic field due to the section PQ at a point X = + a will be :-

(1) Proportional to a

(2) Proportional to a^2

(3) Proportional to 1/a

(4) Zero

Solution.

We have the following picture:

We need to find the magnetic field at the point M. We use the Biot-Savart law:

$$B = \frac{\mu_0}{4\pi} \int \frac{I d\boldsymbol{l} \times \boldsymbol{r}}{|\boldsymbol{r}|^3}$$

But in our case, $d\boldsymbol{l} \parallel \boldsymbol{r}$, so $d\boldsymbol{l} \times \boldsymbol{r} = \boldsymbol{0}$.

This means that $\boldsymbol{B} = 0$ at point M. Therefore, the magnetic field at this point is zero.

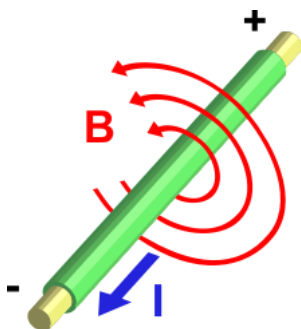It is also evident from the fig.1 and fig.2:
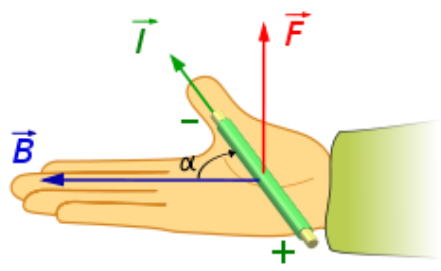

fig.1. This is magnetic field of conductor with current.

fig.2. The right-hand rule.

Answer.

(4) Zero