

### Topic 03. Electricity and Magnetism. Part 2

1. Find the magnetic field produced by the wire with current at point  $O$  (see Fig.3), if  $I = 5.0$  A,  $R = 120$  mm, and the angle  $2\varphi = 90^\circ$ .
2. A coil is connected in series with a  $10.0\text{ k}\Omega$  resistor. An ideal  $50.0$  V battery is applied across the two devices, and the current reaches a value of  $2.00$  mA after  $5.00$  ms. (a) Find the inductance of the coil. (b) How much energy is stored in the coil at this same moment?
3. A particle with charge  $2.0$  C moves through a uniform magnetic field. At one instant the velocity of the particle is  $(2.0\vec{i} + 4.0\vec{j} + 6.0\vec{k})$  m/s and the magnetic force on the particle is  $(4.0\vec{i} - 20\vec{j} + 12\vec{k})$  N. The  $x$  and  $y$  components of the magnetic field are equal. What is  $\vec{B}$ ?
4. [**ADVANCED LEVEL**] An ion source is producing  ${}^6\text{Li}$  ions, which have charge  $+e$  and mass  $9.99 \times 10^{-27}$  kg. The ions are accelerated by a potential difference of  $10$  kV and pass horizontally into a region in which there is a uniform vertical magnetic field of magnitude  $B = 1.2$  T. Calculate the strength of the smallest electric field, to be set up over the same region, that will allow the  ${}^6\text{Li}$  ions to pass through undeflected .

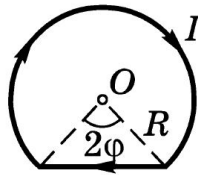


Figure 1