Question #54316, Physics / Electromagnetism |

the magnitude of velocities of two alpha particles A and B entering a uniform magnetic field perpendicularly, are in the ratio 6:1. on entering the field , they move in circular paths. find out the ratio of radii of their paths.
solve it by giving proper explaination about the formula.

Answer:

The force exerting on the charged particles moving in the magnetic field is defined by the equation:

$F = qvB$, where q – the charge, v – the velocity and B – the magnetic field

At the same time the centripetal force acting on the object is:

$F_c = (mv^2)/r$

Since these forces have the same magnitude the final equation should be:

$qvB = (mv^2)/r$,

$r = (mv)/(qB)$

Therefore for particles having the same mass and charge, which are travelling in the same magnetic field, their radii are proportional to their velocities:

For alpha particle A: $r(A) = [m/(qB)]\, v(A)$

For alpha particle B: $r(B) = [m/(qB)]\, v(B)$

$r(A)/r(B) = v(A)/v(B) = 6/1 = 6$

The radius of trajectory for A is in 6 times larger than that for B.