A line of force.

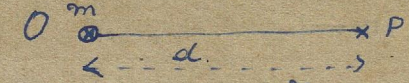
A line of force in a magnetic field is the imaginary line along which a unit north pole free to move in the field moves.

The line of force at a point or the tangent to the line of force at the point gives the direction of the field at that point.

By convention the number of lines of force threading through unit area of the field gives numerically the magnetic field strength. For example if in a uniform magnetic field of strength R and area A sq. cms. is taken the number of lines of force threading through the area will be equal to AR. This is called the induction over the area. If further all the lines of force are normal to the area, AR is called the normal induction over the area.

To find the number of lines of force emerging from a single pole of strength m.

Consider a pole of strength m cgs units at O and a point P



whose distance is d from O. Then the field at P $= \frac{m}{d^2}$. Imagine a sphere to be drawn with O as centre and radius equal to d. The induction over the surface of this sphere is $AR = 4\pi d^2 \times \frac{m}{d^2} = 4\pi m$.

Magnetism

Fundamental Definitions. Magnetic field & Magnetic force

Unit magnetic pole is that pole which when placed at unit distance in air from an exactly similar pole repels it with a force of one dyne.

Two poles of strength ~~m1~~ m_1 and ~~m2~~ m_2 separated in air by a distance d cms will have a force of attraction or repulsion between them given by ~~F mlm2/d2 dyne.~~ but $F = \frac{m_1 m_2}{d^2}$ dynes.

If the separating medium is not air, ~~by~~ any other dielectric separates the poles the force between the poles will become ~~F mlm2/ D2 dynes~~. $F = \frac{m_1 m_2}{\mu d^2}$ dynes.

where μ is called the permeability of the medium.

The field strength at a point is a vector quantity ~~and~~ ant as ~~h~~such has not only magnitude but also direction. It is given in magnitude and direction by the force acting on unit north pole placed at that point.

The field strength at a point P due to a single pole of strength ~~m cgs~~ m c.g.s. units ~~F m.1 /d2~~ $F = \frac{m \times 1}{d^2} = \frac{m}{d^2}$ Gauss. ~~m/d2~~ gauses.

If any other dielectric intervenes as the medium, the field is ~~f m/ d2~~ $F = \frac{m}{\mu d^2}$ Gauss.

~~Definition.~~ Permeability can be defined as the ratio of the field at a point due to a pole when air is the intervening medium to the field at the same point due to the same pole when the dielectric is the intervening medium.