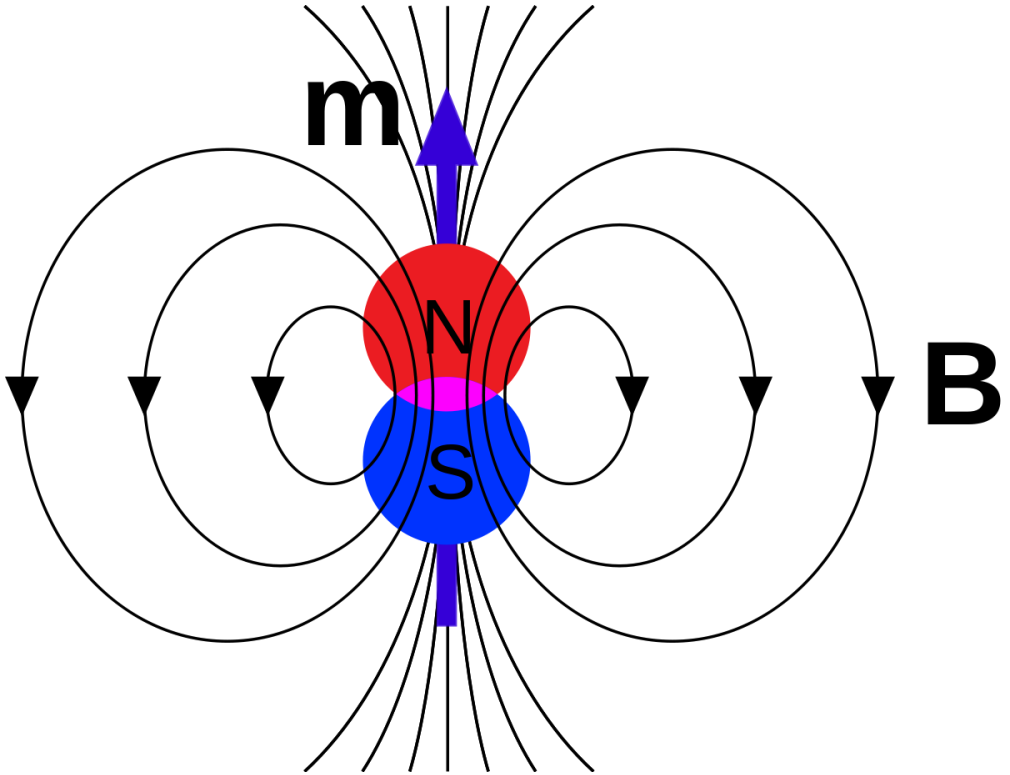
Consider line of charge with uniform charge density, $\lambda = \rho\pi a^2$. What is the magnitude of the electric field outside of the line charge (at a distance $s > a$)?

A. $E = \lambda/(4\pi\varepsilon_0 s^2)$
B. $E = \lambda/(2\pi\varepsilon_0 s^2)$
C. $E = \lambda/(4\pi\varepsilon_0 s)$
D. $E = \lambda/(2\pi\varepsilon_0 s)$
E. Something else?!

Use Gauss' Law

MAGNETIC DIPOLES



The leading term in the vector potential multipole expansion involves:

$$\oint d\mathbf{l}'$$

What is the magnitude of this integral?

A. R
B. $2\pi R$
C. 0
D. Something entirely different/it depends!

The vector potential for the dipole is:

$$\mathbf{A}_d = \frac{\mu_0}{4\pi r^2}\mathbf{m} \times \hat{\mathbf{r}}$$

What is the magnitude of that cross product $|\mathbf{m} \times \hat{\mathbf{r}}|$?

A. 1
B. m
C. $mr \sin\theta$
D. $m \sin\theta$
E. Something else?

The vector potential for the dipole is:

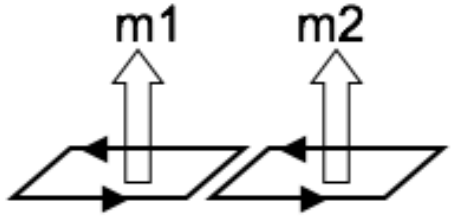
$$\mathbf{A}_d = \frac{\mu_0}{4\pi r^2}\mathbf{m} \times \hat{\mathbf{r}}$$

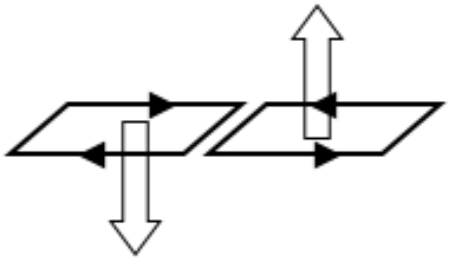
If the magnetic dipole moment points in the $\hat{\mathbf{z}}$ direction, what is the direction of the $\mathbf{A}_d$?

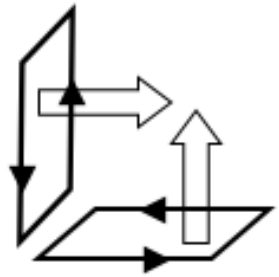
A. $\hat{\mathbf{z}}$
B. $\hat{\phi}$
C. $\hat{\mathbf{r}}$
D. $\hat{\mathbf{m}}$
E. Something else?

Two magnetic dipoles m_1 and m_2 (equal in magnitude) are oriented in three different ways.

Which ones can produce a dipole field at large distances?

1. 

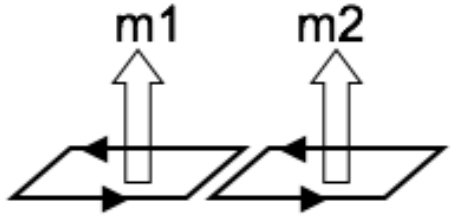
2. 

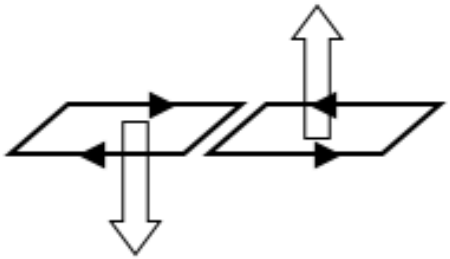
3. 

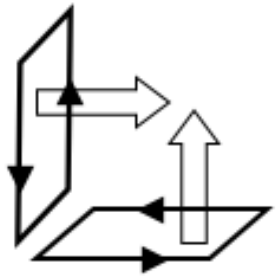
A. None of these
B. All three
C. 1 only
D. 1 and 2 only
E. 1 and 3 only

Two magnetic dipoles m_1 and m_2 (**unequal** in magnitude) are oriented in three different ways.

Which ones can produce a dipole field at large distances?

1. 

2. 

3. 

A. None of these
B. All three
C. 1 only
D. 1 and 2 only
E. 1 and 3 only

MAGNETS, HOW DO THEY WORK?

Insane Clown Posse - Miracles

PARAMAGNETISM & MAGNETIC DOMAINS