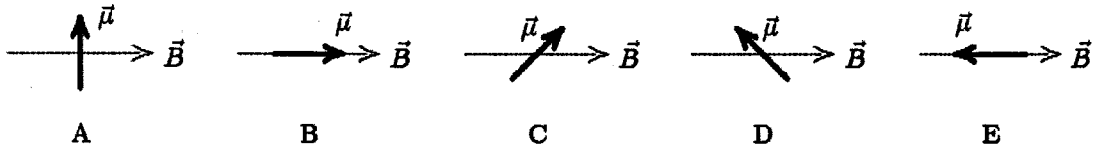
Phys 102 – Sec # 42 **Quiz # 10 (Ch. 28)**

Name: (Key) **ID #**

1- The diagrams show five possible orientations of a magnetic dipole μ in a uniform magnetic field B.



a) For which of these does the magnetic torque on the dipole have the greatest magnitude?

$\vec{\tau} = \vec{\mu} \times \vec{B}$

$|\tau| = \mu B \sin\phi$

$\tau_{greatest}$ is (A) where $\phi = 90^\circ$.

b) For which of these is the magnetic potential energy of the dipole the greatest?

$U_B = -\vec{\mu} \cdot \vec{B} = -\mu B \cos\phi$

U_B is greatest for (E) where $\phi = 180^\circ$.

2- In a uniform magnetic field, a particle of charge 1.5 μC and mass 2.0 μg completes 5 revolutions in one second. What is the magnitude of the magnetic field?

$T = \frac{1}{5} s = \frac{2\pi r}{v}$

For circular orbit

$qvB = m\frac{v^2}{r}$

$v = \frac{qBr}{m}$

$0.2 = \frac{2\pi \cancel{r}\, m}{qB\cancel{r}} = \frac{2\pi m}{qB}$

$B = \frac{2\pi m}{0.2\, q} = \frac{2\pi * 2\times10^{-9}}{(0.2)(1.5*10^{-6})} = 41.9 * 10^{-3}\ T$