P3323 quiz8-3
October 14, 2016

1. The force on a magnetic dipole moment $\mathbf{m}$ in a magnetic field $\mathbf{B}$ is

   A) zero

   B)

   $$\mathbf{F} = \mathbf{B} \times \mathbf{m}$$

   C)

   $$\mathbf{F} = \nabla(\mathbf{B} \times \mathbf{m})$$

   D)

   $$\mathbf{F} = \nabla(\mathbf{B} \cdot \mathbf{m})$$

2. The torque on a magnetic dipole moment $\mathbf{m}$ in a $uniform$ magnetic field $\mathbf{B}$ is

A) zero

B)

$$\mathbf{N} = \mathbf{B} \times \mathbf{m}$$

C)

$$\mathbf{N} = \mathbf{m} \times \mathbf{B}$$

D)

$$\mathbf{N} = \nabla(\mathbf{B} \cdot \mathbf{m})$$

3. The force on a magnetic dipole moment $\mathbf{m}$ in a $uniform$ magnetic field $\mathbf{B}$ is

A) zero

B)

$$\mathbf{F} = \mathbf{B} \times \mathbf{m}$$

C)

$$\mathbf{F} = \nabla(\mathbf{B} \times \mathbf{m})$$

D)

$$\mathbf{F} = \nabla(\mathbf{B} \cdot \mathbf{m})$$

E) more than one of the above

4. Consider an electron circling a nucleus in an atom. The dipole moment $\mathbf{m} = I\mathbf{a}$ where $\mathbf{a}$ is the vector with magnitude equal to the area of the loop and direction perpendicular to the area. The right hand rule relates direction of $\mathbf{a}$ to direction of I. Also $I = q/T$ where T is the period of revolution. The atom is placed in an external magnetic field oriented perpendicular to the current loop so $\mathbf{B}$ and $\mathbf{m}$ are parallel. The effect of the external field is to

   A) Increase $\mathbf{m}$

   B) Decrease $\mathbf{m}$

   C) Have no effect on $\mathbf{m}$

   D) Depends on whether $\mathbf{B}$ and $\mathbf{m}$ are in the same or opposite directions.