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 \( m \) in a uniform magnetic field \( B \) is

A) zero

B)

\[ N = B \times m \]

C)

\[ N = m \times B \]

D)

\[ N = \nabla(B \cdot m) \]
3. The force on a magnetic dipole moment \( \mathbf{m} \) in a \textit{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 \( I = \frac{q}{T} \) 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.