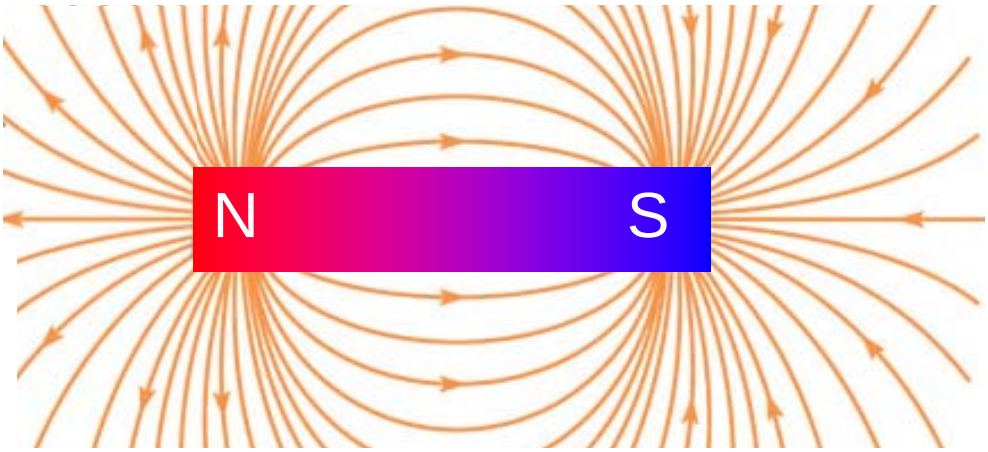
Phys 104: College Physics

Name Key

Quiz 3

2)[2] For the magnet shown below, draw the magnetic field lines.



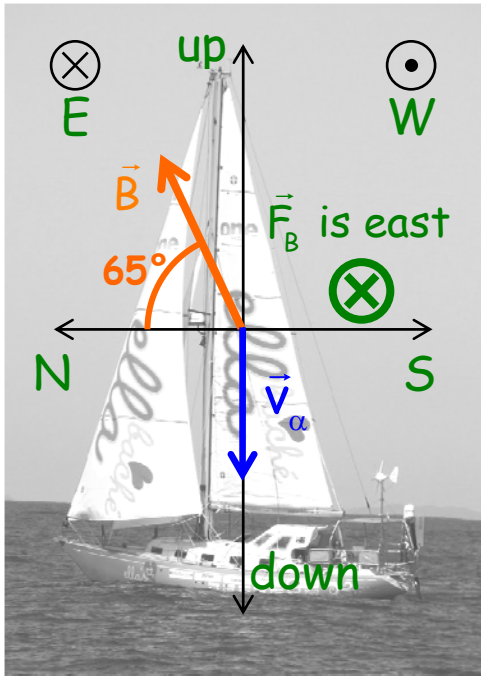
2)[6] Jessica Watson, sailing *Ella's Pink Lady* off the coast of Australia where B = 60 nT, 65° upward from north, sees an α-particle with q = +2e shoot straight down at $v_\alpha = 30 \times 10^6$ m/s.

a)[2] Label the (six) directions indicated

b)[2] Draw vectors for $\vec{v}_\alpha$, $\vec{B}$ and F_B

c)[4] Find the magnetic force on the α-particle (mag. & dir.).

$$\vec{F}_B = q\vec{v} \times \vec{B} \quad \Rightarrow \quad F_B = qvB\sin\theta$$



a) Shown on the diagram … flipping it so that north is to the right would also work.

c) By the right hand rule, F_B is into the page. Since north is to the left, east is into the page and west is out. Thus the magnetic force on the α-particle is to the east.

$$F_B = 2\left(1.6\times10^{-19}\right)\left(30\times10^{6}\right)\left(60\times10^{-9}\right)\sin(155)$$

$$\vec{F}_B = 2.42\times10^{-19}\ \text{N to the east}$$