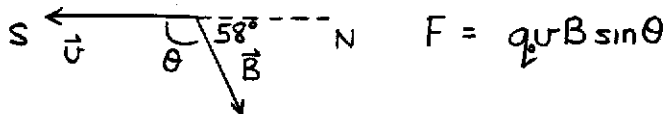**B1.** A beam of protons, moving horizontally with speed 6.19×10^5 m/s, is directed from north to south in the northern hemisphere. The Earth's magnetic field at this point has a magnitude of 8.00×10^{-5} T and is at an angle of 58° below the horizontal. Calculate the magnitude of the magnetic force which acts on each proton.

$$F = qvB\sin\theta$$

$$F = (1.60 \times 10^{-19} \, C)(6.19 \times 10^5 \, m/s)(8.00 \times 10^{-5} \, T) \sin(180° - 58°)$$

$$\boxed{F = 6.72 \times 10^{-18} \, N}$$

B2. The critical angle for a particular type of glass is measured to be 58.7° when a piece of this glass is immersed in water ($n_{water} = 1.33$). Calculate the index of refraction of this glass.
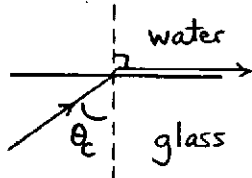
Snell's Law :

$$n_{glass} \sin\theta_c = n_{water} \sin 90°$$

$$n_{glass} = \frac{1.33 \sin 90°}{\sin 58.7°} = \boxed{1.56}$$