Electromagnetism Questions

1) $L = 0.10\ m$
$I = 5.0\ A$
$\theta = 90°$
$F = 0.20\ N$
$B = ?$

$F = I L B \sin\theta$

$B = \dfrac{F}{IL\sin\theta}$

$= \dfrac{0.20\ N}{(5.0\ A)(0.10\ m)(\sin 90°)}$

$= \dfrac{0.20\ N}{(5.0\ A)(0.10\ m)(1.000)}$

$\boxed{B = 0.40\ T}$ (2 sig figs)

2) $L = 115\ m$
$\theta = 90°$
$B = 5.0 \times 10^{-5}\ T$
$I = 400\ A$
$F = ?$

$F = BIL\sin\theta$ (1.000)

$= (5.0 \times 10^{-5}\ T)(400\ A)(115\ m)(\sin 90°)$

$= 2.300\ N$

$\boxed{F = 2\ N}$ (1 sig fig)

3) $L = 0.10\ m$
$I = 2.0\ A$
$\theta = 90°$
$F = 0.04\ N$
$B = ?$

$B = \dfrac{F}{IL\sin\theta} = \dfrac{F}{IL(\sin 90°)} = \dfrac{F}{IL}$

$= \dfrac{0.04\ N}{(2.0\ A)(0.10\ m)}$

$= 0.200\ T$

$\boxed{B = 0.2\ T}$ (1 sig fig)

4) $L = 0.50\ m$
$I = 8.0\ A$
$\theta = 90°$
$B = 0.40\ T$
$F = ?$

$F = BIL\sin\theta$

$= (0.40\ T)(8.0\ A)(0.50\ m)(\sin 90°)$

$= (0.40\ T)(8.0\ A)(0.50\ m)(1.000)$

$\boxed{F = 1.6\ N}$ (2 sig figs)

5) $L = 75\,cm$
$= 0.75\,m$
$I = 6.0\,A$
$\theta = 90°$
$F = 0.60\,N$
$B = ?$

$B = \frac{F}{IL}$ when $\theta = 90°$

$= \frac{0.60\,N}{(6.0\,A)(0.75\,m)}$

$= 0.1333\,T$

$= 1.3 \times 10^{-1}\,T$ (2 sig figs)

6) $L = 40\,cm$
$= 0.40\,m$
$I = 6.0\,A$
$\theta = 90°$
$F_g = 0.35\,N$
$B = ?$

① $F_g = F_B$ - since forces are balanced

② $B = \frac{F}{IL}$

$= \frac{0.35\,N}{(6.0\,A)(0.40\,m)}$

$= 0.1458\,T$

$\boxed{B = 1.5 \times 10^{-1}\,T}$

7) Temporary magnets - require an electric current act as a magnet (have a magnetic field)

Permanent magnet - have a net magnetic field without an electric current

8) Iron, cobalt, nickel (and their alloys)

9) If you break a magnet into pieces you get smaller magnets. IT is not possible to seperate the N and S ends of a magnet

10) See your notes

11) Dropping or heating a magnet adds energy to the system which increases the randomness of the

magnetic moments. This intern reduces the size of the domains and therefore the overall strength of the magnetic field.

12 See notes

13 The pole attracts the north end of a magnet (or compass). Since opposites attract the Northern hemispheres pole is a S-pole

14) Magnetic declination - The angle between magnetic North and True north

15) stationary e^- charge - electric field

moving e^- charge - electric field
- magnetic field

16) The moving e^- (current) adds (vectorially) with the magnetic moments in the iron to produce a stronger field.

17) Since $F = BIL \sin\theta$ $\quad 0 \leq \sin\theta \leq 1$

Maximum Force when $\sin\theta = 1$

$\theta = \sin^{-1}$

$\theta = 90°$

Minimum Force when $\sin\theta = 0$

$\theta = \sin^{-1} 0$

$= 0°$