

Magnetic Fields and Transformers

Equations: $F=Bqv$ $F=ILB$ $V_p/N_p=V_s/N_s$

- 1) A 300.m wire carries a current of 0.23A perpendicular to the Earth's magnetic field of $3.8 \times 10^{-5}T$. What is the magnitude of the force experienced by the wire?
- 2) If the current in a wire is moving north, and the magnetic field is moving from east to west, then which direction will the wire be deflected?
- 3) If a wire has a current going straight down into the ground, and the Earth's magnetic field is traveling perpendicular to it, then which direction will the Earth's magnetic field bend the wire?
- 4) An electron with a charge of $1.60 \times 10^{-19}C$ is moved by a magnetic field of 2.8T and is traveling with a velocity of $6.1 \times 10^5m/s$. What force does it experience?
- 5) What is the magnetic field strength if a 0.35m wire carrying a current of 2.0A is deflected by a force of 0.0031N?
- 6) What is the charge on a particle that is traveling at $1.2 \times 10^3m/s$ if a force of 0.0035N is felt from a magnetic field strength of 1.2T?
- 7) A particle is moving from your left to right across a room. There is a magnetic field of $4.62 \times 10^{-4}T$ in the room going upward from the floor at a 62° angle in the same plane as the moving particle. What component of the force on the particle from this magnetic field, and would the particle be deflected toward you or away from you?
- 8) What is the voltage in the secondary coil of a transformer if the primary voltage was 120000V, and the primary coil was 300 turns, and the secondary coil had 20 turns? Is this a step-up or step-down transformer?
- 9) How many turns must be put in the primary coil if it is a step-up transformer that has 200 turns in the secondary coil and the primary voltage is 200V, and the secondary voltage is 400V?

Answers

- 1) $2.62 \times 10^{-3}N$
- 2) up
- 3) west
- 4) $2.73 \times 10^{-13}N$
- 5) $4.4 \times 10^{-3}T$
- 6) $2.43 \times 10^{-6}C$
- 7) $4.08 \times 10^{-4}T$, away.
- 8) 8000V, step-down
- 9) 100 turns