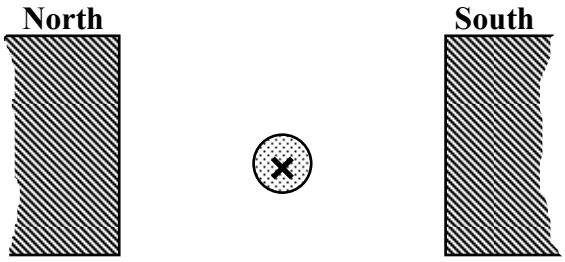
**PHYSICS 12 MAGNETIC FIELDS WORKSHEET 3**

**Unless otherwise stated, assume conventional current.**

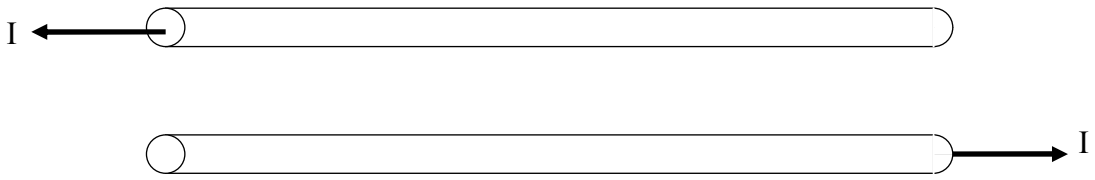
1. Examine the diagram to the left, showing a 5.0 cm-long wire carrying 30 A of current into the page, situated in a magnetic field of 0.80 T between two strong magnets.
   a) Draw the magnetic field lines created by the two magnets.
   b) Determine the magnitude and direction of the force that acts on the wire.




2. A current-carrying wire of length 1.6 cm is between the pole faces of a magnet, perpendicular to the direction of the magnetic field there. If the current in the wire is 24 A and the magnetic field strength is 0.072 T, what is the magnetic force on the wire?

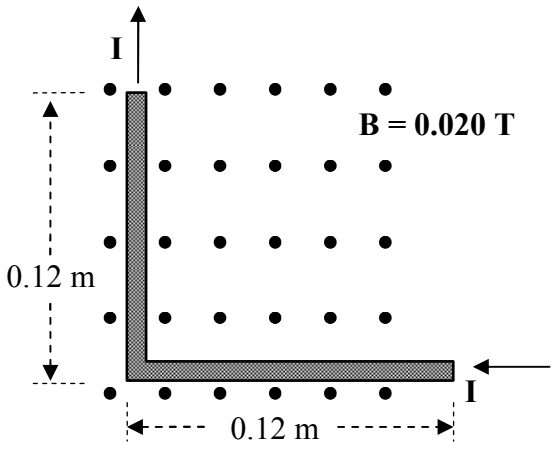
3. A horizontal copper conductor of mass 8.4 g and length 30.0 cm is placed perpendicular to Earth's magnetic field (field strength = $5.0 \times 10^{-5}$ T). What current is needed in the conductor to balance the gravitational forces on the conductor, and have the conductor suspended in mid-air?

4. Two parallel wires carry currents in opposite directions, as shown in the diagram below.
   a) Use both versions of the right-hand rule to determine whether the wires will *attract* or *repel* each other.
   b) In which direction will a strong **external** magnetic field act to cause the two current-carrying wires shown to move *towards* each other.

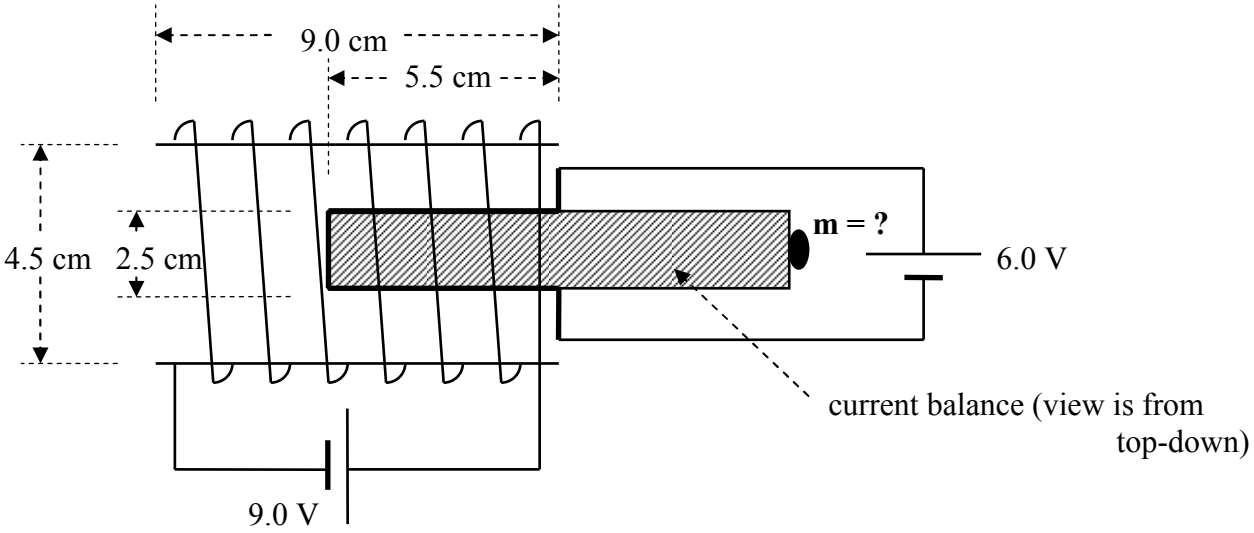



5. The diagram to the right shows an L-shaped conductor within a magnetic field of **B = 0.020 T** and carrying a current of **25 A**.

   Determine the magnitude of the net magnetic force acting on the conductor.



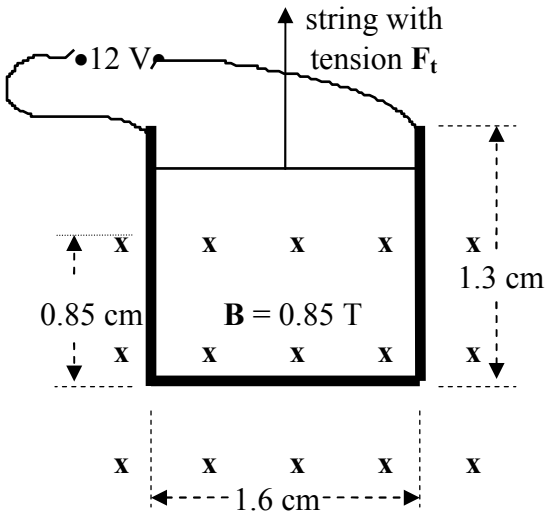
6. The diagram below shows a current balance placed in a solenoid that has 640 turns of wire. If the resistance of the solenoid is 2.5 Ω and the resistance of the wire used in the balance is 1.5 Ω, how much mass '**m**' must be placed on the other end of the beam in order to achieve balance?




7. A solenoid consisting of 560 turns/cm has a current of 2.4 A through the windings. A section of wire 1.6 cm long is placed inside the solenoid and has a separate current of 3.2 A running through it.
   a) What is the strength of the solenoid's magnetic field?
   b) If the wire is placed parallel to the central axis of the solenoid, what is the magnetic force on the wire?
   c) The wire is now placed perpendicular to the field inside the solenoid. If the same current flows in the wire, what is the magnetic force on the wire now?

8. The magnetic field inside a current-carrying solenoid is 0.036 T. When a wire 2.2 cm long, part of a current balance, is placed in the solenoid perpendicular to the magnetic field, a 6.0 x $10^{-5}$ kg mass is required to balance the magnetic force in the wire. What is the current in the wire?

9. The diagram to the right shows a U-shaped conductor with a resistance of 5.0 Ω attached to a 12 V power supply and suspended by a light string partially in a magnetic field of strength 0.85 T. The mass of the conductor is 4.2 g and its dimensions are as illustrated.
   a) On the diagram, label the positive and negative ends of the power supply that will create an *upward* magnetic force on the conductor.
   b) If the magnetic force is indeed upward, what will be the resulting tension **T** in the string holding the conductor?
   c) If the voltage in the power supply were reduced, how would the tension change? What would the value of **T** be if the voltage were dropped to '0'?




1. a) left-to-right b) 1.2 N down the page 2. 0.028 N 3. 5.5 x $10^{3}$ A 4. a) they repel b) into the page 5. 0.085 N
6. 3.3 x $10^{-4}$ kg 7. a) 0.17 T b) 0 c) 8.6 x $10^{-3}$ N 8. 0.74 A 9. b) 8.5 x $10^{-3}$ N c) increase; 4.1 x $10^{-2}$ N