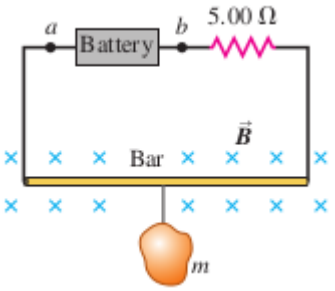
Name _____

PHY2049C, Homework 5

A- Submit a handwritten version of the solutions (clearly readable) at the beginning of class.

Problem 1

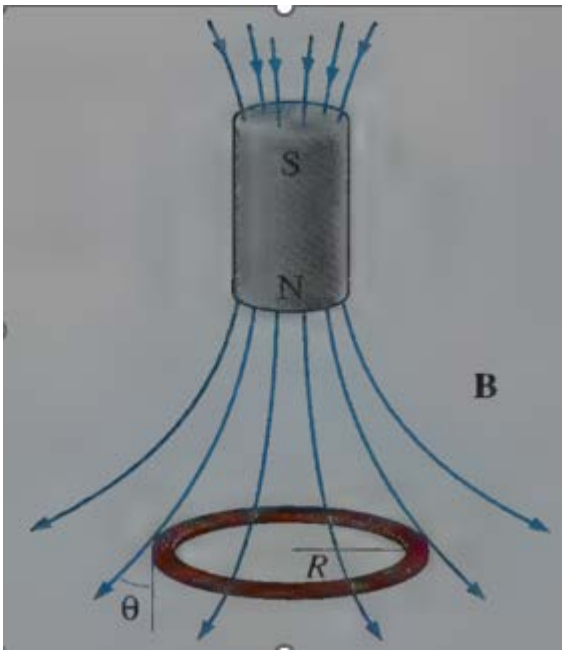


The circuit shown in the figure to the right is used to make a magnetic balance to weigh objects. The mass m to be measured is hung from the center of the bar that is in a uniform magnetic field of 1.00 T, directed into the plane of the figure. The battery voltage can be adjusted to vary the current in the circuit. The horizontal bar is 50.0 cm long and is made of extremely light-weight material. It is connected to the battery by thin vertical wires that can support no appreciable tension; all the weight of the suspended mass m is supported by the magnetic force on the bar. A resistor with R = 4.00 Ω is in series with the bar; the resistance of the rest of the circuit is much less than this. (a) Which point, a or b, should be the positive terminal of the battery? (b) If the maximum terminal voltage of the battery is 175 V, what is the greatest mass m that this instrument can measure?

Problem 2

A circular wire loop of mass m and radius R carries a current I. The loop is hanging horizontally below a cylindrical bar magnet, suspended by the magnetic force, as shown in the Figure. If the field lines crossing the loop make an angle θ with the vertical, show that the strength of the magnetic field is

$$B = \frac{mg}{2\pi RI\sin\theta}$$



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Problems from a CERN (European Organization for Nuclear Research) workshop on Complex Numbers.

Problem 3

Compute real and imaginary part of $z = \frac{i-4}{2i-3}$

Problem 4

Compute the absolute value and the conjugate of

$z = (1+i)^6$

$w = (3+3i)^8$

Problem 5
Write in the "algebraic" form $(a+ib)$ the following complex numbers

$z = i^5 + i + 1$

$w = (3+3i)^8$

Problem 6
Write in the "trigonometric" form *(A(cos θ + i sin θ))* the following complex numbers

a) 8

b) $6i$

c) $\left(\cos\frac{\pi}{3} - i\sin\frac{\pi}{3}\right)^7$

Problem 7
Compute the square roots of $z = -1 - i$

Problem 8
Compute the cube roots of z = −8.

Problem 9
Find $z \in \mathbb{C}$ such that $z^2 \in \mathbb{R}$.