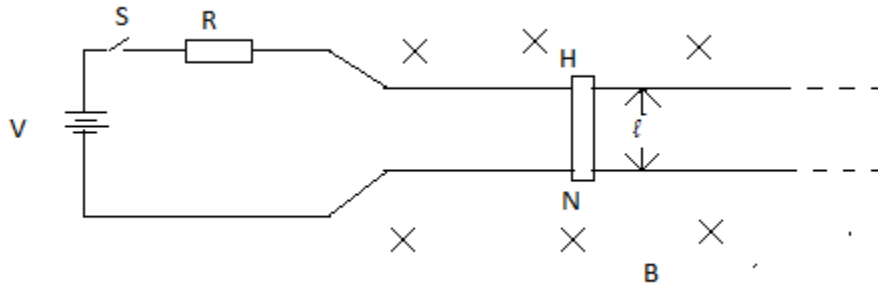
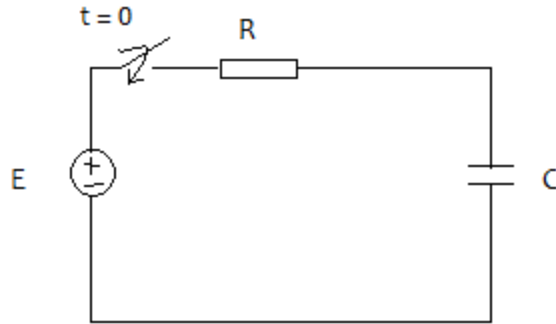


1. In the diagram, the circuit is set on a rigid frame, and HN bar is a conductor with mass m and it can move along the frictionless track which can be considered infinitely long. Separation between the two parallel wires of the track is l . A uniform magnetic field B , vertically downward on the page, has been set throughout the entire system.



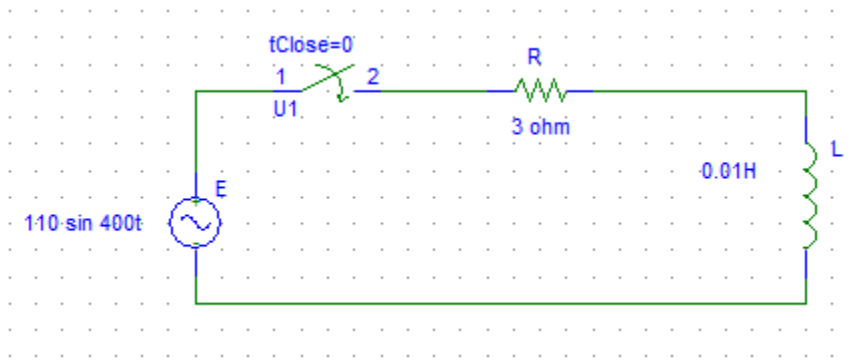
- a. When the switch is closed HN bar will start to move along the track. In which direction will the bar move? 1
 - b. Find an expression for the velocity u of the bar using the given terms. What will be the highest magnitude of that velocity? 3
 - c. Now the DC voltage source is replaced by a pulsating source with rectangular wave form of frequency .2 Hz. It gives +20V in first 5 seconds, and -20V in next 5 seconds; this way its polarity flips after every 5 seconds. It is given that
 $R = 10 \text{ ohm}$
 $L = 1\text{m}$
 $M = .25\text{kg}$
 $B = .5\text{T}$
 If the switch is closed at $t = 0\text{s}$, determine the velocity of the bar at $t = 10\text{s}$. 4
2. For a single slit diffraction experiment monochromatic light of wavelength λ is used. Find an expression for the intensity at a point P, whose angular separation from central maximum is θ . Slit width is d and the intensity of the central maximum is I_0 . 3
 3. Through a leak of a kerosene ($\mu = 1.2$) tank oil has fallen into sea and has created a slick on top of the water ($\mu = 1.33$). If someone looks straight down from a helicopter onto a region of the slick where the thickness is 465 nm, for which wavelengths of visible light is the reflection the greatest? 2

4. It is given that when $t = 0\text{s}$, $q_0 = 0$.



Find an expression for the charge q that accumulates on the positive plate of the capacitor at time t . 2

5.



For above circuit-

- Find total impedance. 1
- Find an expression for current i as a function of time t after closing the switch at $t = 0\text{s}$. 3
- Between voltage and current which one leads? Determine the phase shift of current. 1