1. A magnetic levitation train runs on two parallel rails, 1.20m apart. The rails

each carry the same current, *I* = 1.00 × 103 A, but in opposite directions.

One section of rail is 20.0 m long. What is the magnitude and direction of

the total force acting between the rails along one complete section?

2. In the velocity selector region of a mass spectrometer, an electric field of

2.34 × 103 N/C is perpendicular to a magnetic field, *B* = 1.56 × 10−2 T.

Abeam of positive ions (*q* = +*e*) then enters a region with the same *B* field,

but *no E* field. If the ions are detected at a radius of curvature of *r* = 1.20m,

what is the mass of the unknown ion?

1. A circular loop, 10.0 cm in diameter, rotates from  =30 degrees to =50degrees in 0.15 seconds, relative to a constant magnetic field of *B* = 0.800 T (see the figure below). Find the average emf induced in the loop during this rotation.



1. Apiece of wire slides, without friction, along two similar wires, as shown

in the diagram below. The resistance per unit length of all the wires is

0.350 /m, and a constant magnetic field, *B* = 1.90 T, points up, perpendicular to the loop. The distance between the parallel, fixed wires is 10.0 cm. At the instant the sliding wire moves with velocity,= 1.3m/s, the loop length is *L* = 30.0 cm. What is the current in the loop?



1. A transformer has 360 turns in its primary coil. The input voltage is 120 V

with a 9.0Acurrent, and the output voltage is 24 V. Find

a. the number of turns in the secondary coil.

b. the output current.

1. A window, 1.0 m by 1.0 m, receives 27.0 J of energy, from sunlight, in

One minute. What is the rms magnetic field of the light striking the window?

1. The electric field between two circular plates of a capacitor is changing

at a rate of 1.5 × 106 V/m per second. If the displacement current at this

instant is *I*D = 0.80× 10−8A, find the dimensions of the plates.

1. Two parallel wires both carry currents directed from left to right (see the

diagram below). A circular wire loop lies in the plane of the two wires,

mid-way between them. As always, assume the currents are positive

charges. Sketch the changes in magnetic fields induced and the resultant

current direction in the loop when:

a. *I*1 is increasing and *I*2 is constant.

b. *I*1 is decreasing at a certain rate, and *I*2 is decreasing at twice that rate.



1. Two parallel wires, a distance *L* = 15 cm apart, carry equal currents

*I*1 = *I*2 = 12 A, in opposite directions, as shown in the diagram below.

If *I*1 increases to 15 A, how must *I*2 change to keep the force per unit length

between wires constant once the new currents are steady? Is the force

attractive or repulsive?



I know that the force is repulsive since they are in opposite directions. But im not sure about I2, whether it should increase to 15A in the opposite direction to maintain constant force.

1. Two parallel wires, a distance *L* = 8.0 cm apart, carry currents of

*I*1 = 10Aand *I*2 = 8.0A(in opposite directions, see the diagram below).

Find the direction and magnitude of the total magnetic field produced

by the wires at point *P*, 4.0 cm from the centre of the line joining the wires.



1. A simple DC motor consists of a coil of area 4.2 × 10−4m2,made up of

95 loops of wire. The magnetic field is 0.50 T, horizontally across the coil,

which carries a current of 2.5 A. What is the maximum torque provided

by the motor during its rotation?

1. The coil in a loudspeaker has an inductance of *L* = 56. To produce a

sound of frequency 20 kHz, the current must oscillate between peak values

of +2.2Aand −2.2 A in one half of a period. What average back emf is

induced in the coil during this variation? How does this compare to the

applied emf of 18 V?

1. A simple electric generator contains a 30- turn coil of area 6.6 × 10−4 m2.

The coil spins in a magnetic field of 0.80 T at a frequency of 60Hz.

a. What is the peak output voltage?

b. How must the number of turns be changed to maintain the same output

voltage but operate at a frequency of 50Hz?

1. A DC motor connected to a 120 V power supply develops a back emf of 70 V when running at full speed. If the armature coils have a total resistance of

 2.5 , calculate the power (*P* = *I*2*R*) lost as heat in the coils.

1. A generator produces 5.00A of current at 30.0 V. The current passes

through a transmission line of resistance 1.00 .

a. What is the power delivered after losses in the transmission line?

b. If the generator current is doubled (with E= 30.0 V still) what is the

percentage increase in power delivered through the same transmission

line?