Magnetism

12PHYS - Electricity

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2019

Starter 1

If an object has a charge of $0.03C$, how many electrons has it lost?

Hint: Charge of one electron $= -1.6 \times 10^{-19}C$

Starter 1 Answer

$$n = \frac{0.03}{1.6 \times 10^{-19}}$$
$$n = 1.875 \times 10^{17}$$

Starter 2

There is $80mA$ of current flowing through a $2k\Omega$ resistor.

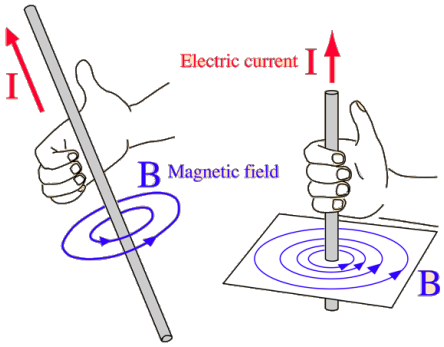
1. How many electrons are going through the resistor in one second?
2. What is the power output of the resistor?

Starter 2 Answer

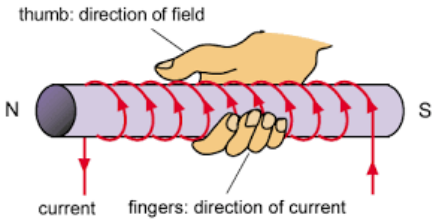
$$I = \frac{q}{t}$$
$$It = q$$
$$q = 0.08 \times 1 = 0.08C$$
$$n = \frac{0.08}{1.6\times^{-19}} = 5 \times 10^{17}$$

$$P = IV, V = IR$$
$$P = I^2R$$
$$P = 0.08^2 \times 2000 = 12.8W(Js^{-1})$$

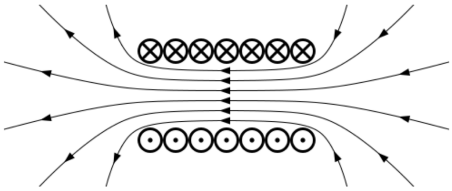
Recall: Right Hand Grip Rule 1



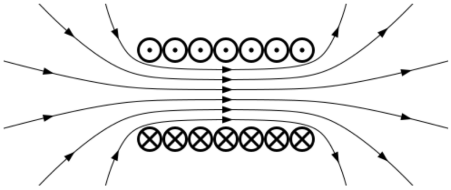
Recall: Right Hand Grip Rule 2



Apply right hand grip rule 2 to this solenoid



Apply right hand grip rule 2 to this solenoid



What is an electric field?

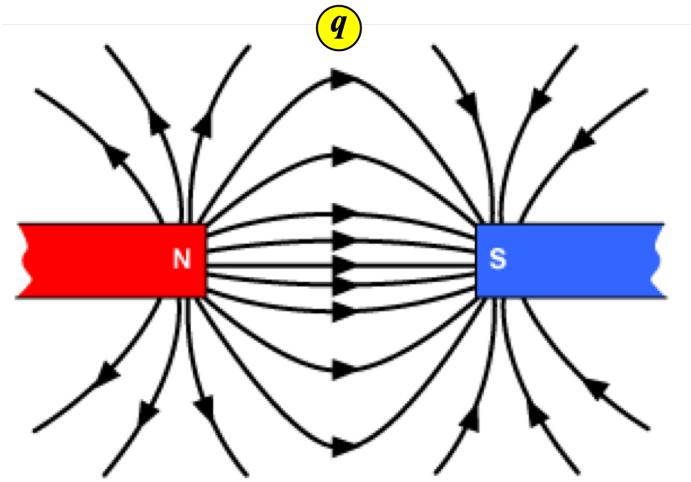
Think, pair and share!

- *A region in which a charged object experiences a force*

What is a magnetic field?

Think, pair, and share!

- *A region in which a moving charged object experiences a force*



The force (F) that the charge experiences as it moves through the field depends on three things:

- Magnetic field strength (B, measured in Tesla (T))
- Charge of the object (q, measured in Coulombs (C))

- Velocity of the object (v, measured in ms^{-1})

$$F = Bqv$$

Let's summarise:

Electric Field: A region in which a charged object experiences a force $F = Eq$

Magnetic Field: A region in which a moving charged object experiences a force $F = Bqv$

Question

A narrow beam of protons ($1.6 \times 10^{-19}C$) moving at a speed of $2.0 \times 10^{-6}ms^{-1}$, enters a uniform magnetic field of strength $0.20T$.

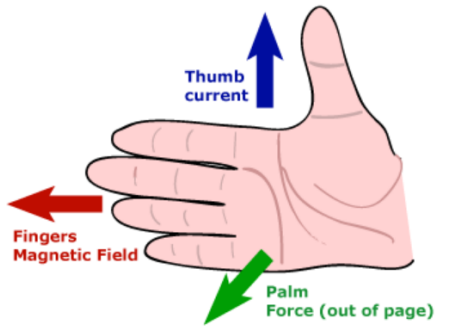
Calculate the magnetic force applied on each proton.

Answer

$$F = Bqv$$
$$F = 0.2 \times 1.6 \times 10^{-19} \times 2.0 \times 10^{-6}$$
$$F = 6.4 \times 10^{-26}N$$

Right Hand Slap Rule

If you use your left hand, the particle is negatively charged

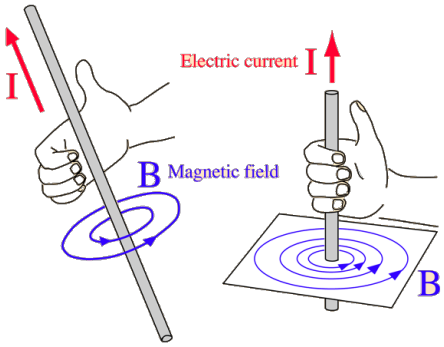


Starter

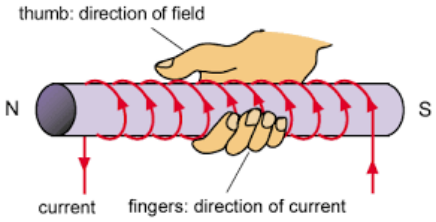
A charged object ($q = 1.6 \times 10^{-19} C$) moves across a magnetic field with a speed of $4.0 \times 10^{3} ms^{-1}$. The magnetic field strength is $12T$.

1. Draw a diagram and illustrate the magnetic field lines
2. Calculate the force applied to the charged object
3. Describe/draw the direction of the force applied

Recall: Right Hand Grip Rule 1

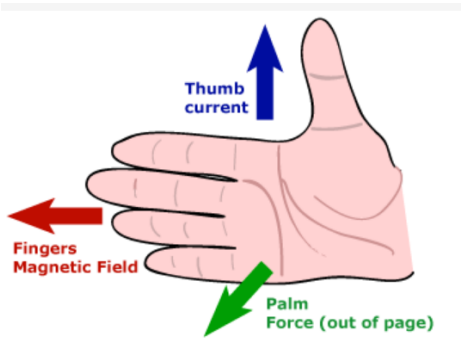


Recall: Right Hand Grip Rule 2

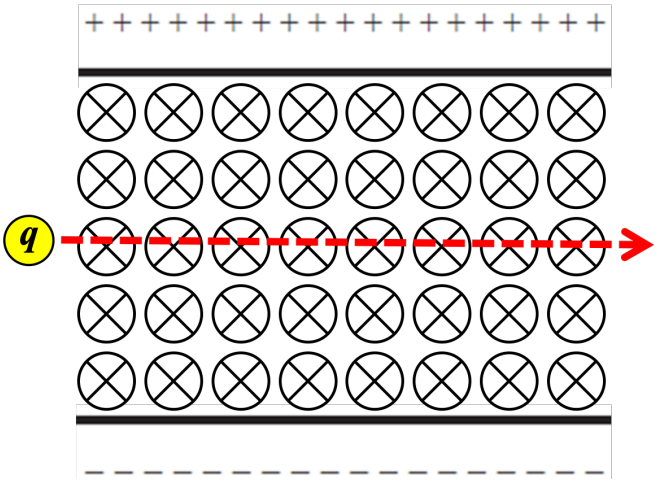


Right Hand Slap Rule

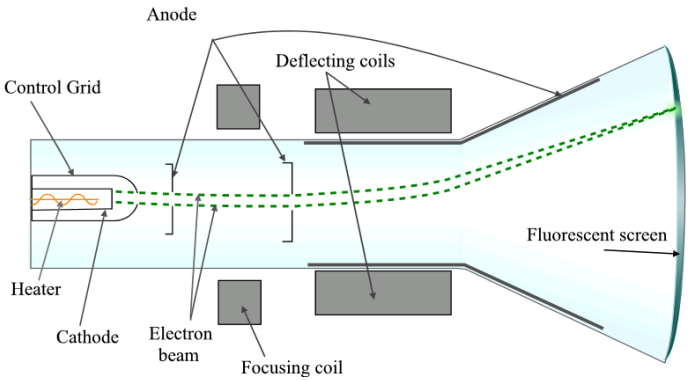
If you use your left hand, the particle is negatively charged. Or use you right hand with the backhand slap rule



Which direction is the force acting in?



Demo: Cathode Ray Tube



- Worksheet 7 Q4 and 5
- Homework booklet Q12 and Q14