

# Magnetic Fields

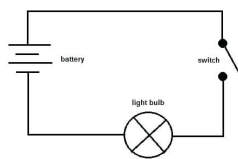
## 12PHYS - Electricity

Finn LeSueur

2019

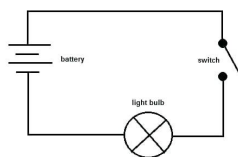
### Starter

The battery is 12V.



1. How many joules of energy does the cell supply to each coulomb of charge that flows out of the cell? **(A)**

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2. When the cell is switched on, the resistance of the lamp is  $9\Omega$ . Calculate the current flowing through the lamp. **(A)**
3. State the meaning of the term **resistance** in terms of electron flow. **(A)**

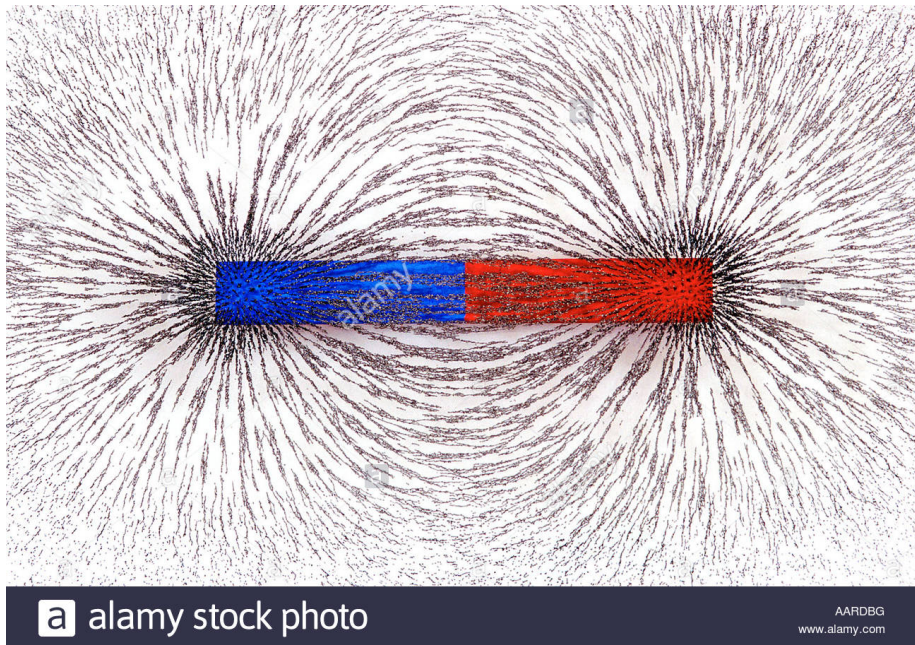
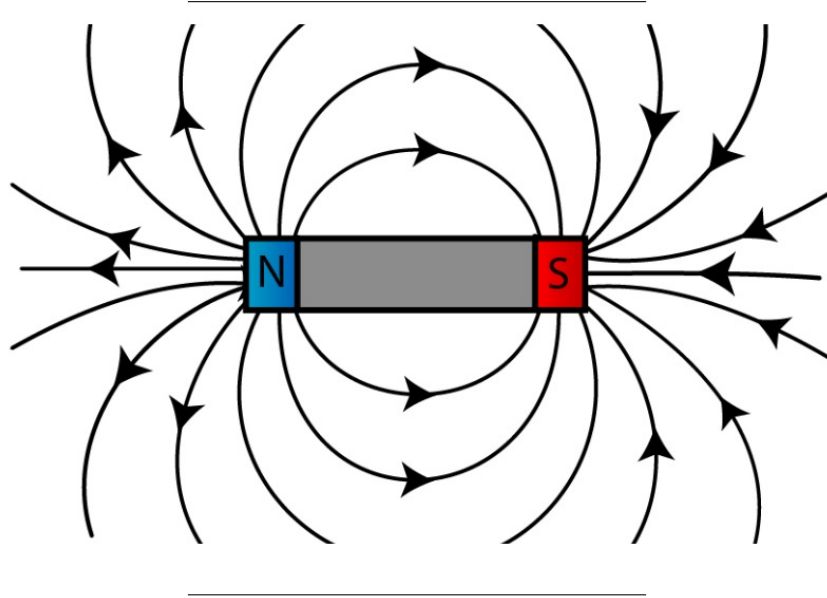
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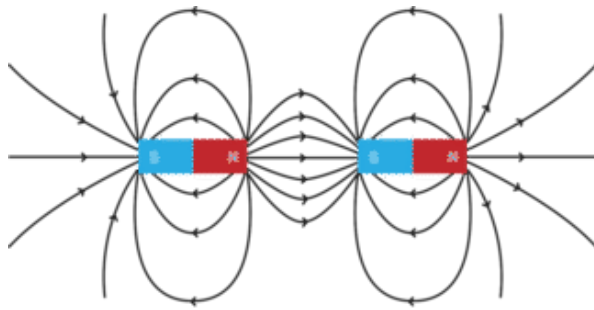
### Magnetic Fields

Magnetic fields can be found in two places:

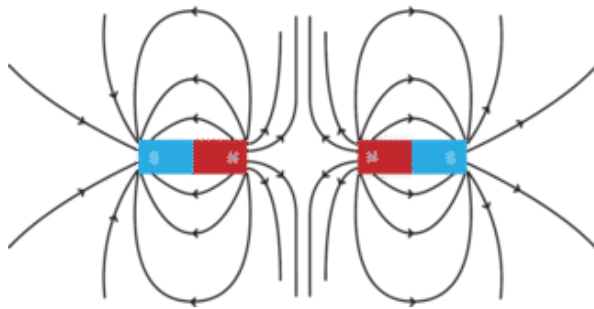
- Around magnetic objects

- Around current carrying wires



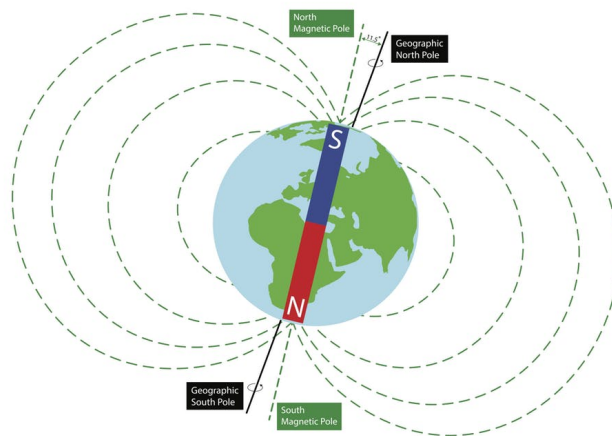


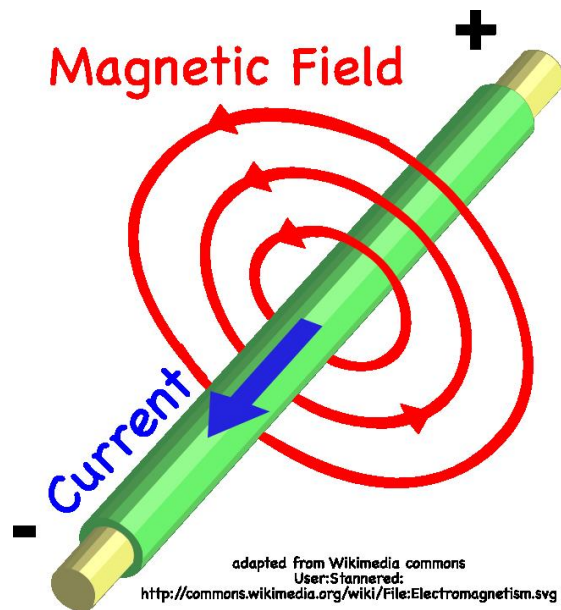
Lines of force around  
a north and south  
pole join together



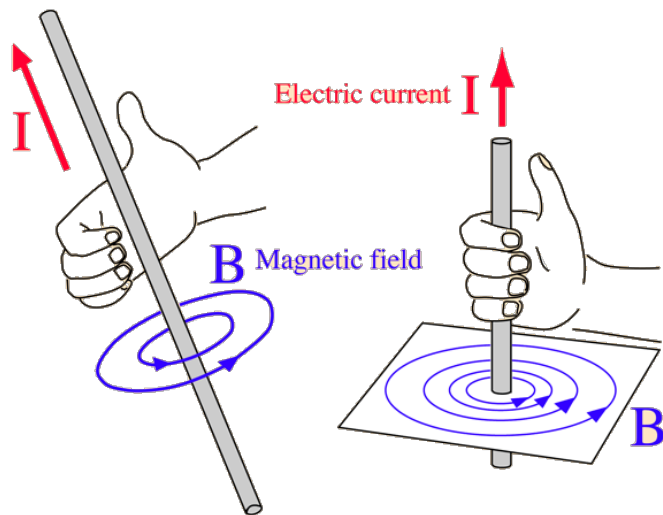
Lines of force around  
two north poles push  
apart

## The Earth's Magnetic Field





### Right Hand Grip Rule 1



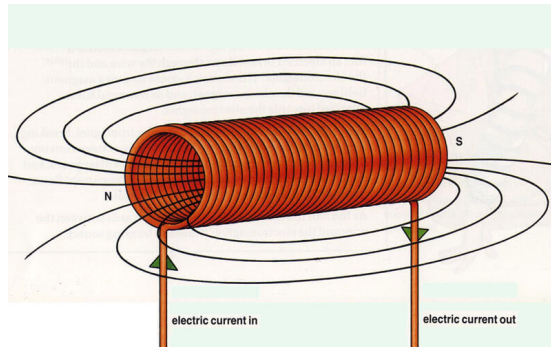


*Magnetic Field  
Out of Page*



*Magnetic Field  
Into Page*

## Solenoids



$$B = \mu_0 n I$$

## What is $\mu_0$ ?

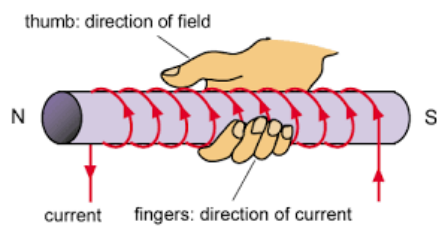
It is pronounced *mew nought* and goes by a variety of names: **vacuum permeability, permeability of free space, permability of vacuum, magnetic constant.**

I will endeavour to call it is the **permeability of free space** and it has the value:

$$\mu_0 = 1.25663706212(19) \times 10^{-6} H/m$$


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## Right Hand Grip Rule 2



H		<div><div><div>■</div>Ferromagnetic</div><div><div>■</div>Antiferromagnetic</div><div><div>□</div>Paramagnetic</div><div><div>■</div>Diamagnetic</div></div>																He										
3	4																	5	6	7	8	9	10					
Li	Be																	B	C	N	O	F	Ne					
11	12																	13	14	15	16	17	18					
Na	Mg																	Al	Si	P	S	Cl	Ar					
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr											
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60					
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe											
55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92					
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn											
87	88	89																										
Fr	Ra	Ac																										
		58	59	60	61	62	63	64	65	66	67	68	69	70	71													
		Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu													