

PHYSICS 112 - REVIEW FOR EXAM 2

CURRENT (I) : rate at which electric charge is flowing in a wire ($I = \Delta Q/T$)

RESISTANCE (R) and POTENTIAL DIFFERENCE (ΔV) related by Ohm's law: $\Delta V = IR$. The power dissipated in a resistor has magnitude $P = I \Delta V = I^2 R = (\Delta V)^2/R$.

BATTERY with potential difference ΔV_{bat} across its terminals: $\Delta V_{\text{bat}} = I_{\text{total}} R_{\text{eq}}$. Power delivered by battery is $P = I_{\text{total}} \Delta V_{\text{bat}}$ (negative if current flows from + terminal to - terminal through battery).

SERIES CIRCUIT: battery and resistors form a circuit in which all moving charges pass through each component in the circuit. $R_{\text{eq}} = \text{sum of all the resistances in the series circuit}$. $I_{\text{total}} = (\Delta V_{\text{bat}})/R_{\text{eq}}$.

R	I	$\Delta V = R \times I$	$P = I \times \Delta V$
R_1	I_{total}		
R_2	I_{total}		
$sum = R_{\text{eq}}$	$same = I_{\text{total}}$	$sum = \Delta V_{\text{bat}} = R_{\text{eq}} \times I_{\text{total}}$	$sum = I_{\text{total}} \times \Delta V_{\text{bat}}$

PARALLEL CIRCUITS: Every parallel circuit has the same potential difference.

R	I	$\Delta V = R \times I$	$P = I \times \Delta V$
R_1	I_1	ΔV_{bat}	
R_2	I_2	ΔV_{bat}	
$R_{\text{eq}} = 1/[1/R_1 + 1/R_2]$	$sum = I_{\text{total}}$	$same = \Delta V_{\text{bat}} = R_{\text{eq}} \times I_{\text{total}}$	$sum = I_{\text{total}} \times \Delta V_{\text{bat}}$

COMPLEX CIRCUITS: May have resistors in series with other resistors and/or parallel circuits. At a junction, the total current coming in equals the total current going out. The sum of the potential differences around a closed circuit is zero; potential differences are ΔV_{bat} across a battery (negative if going from + to - terminal) and $-IR$ when going through a resistor in the direction of the current.

MAGNETISM: Magnetic field \vec{B} is a vector; units: tesla (symbol: T)

(1) (a) Force on a part of a circuit has magnitude $BIL \sin \theta$ (where θ is the angle between the directions of the current and of the magnetic field), with direction given by first right hand rule: curve fingers from direction of I towards direction of B (through the smallest possible angle) and then the thumb, perpendicular to both, points in the direction of the force. (b) Force on a moving charge: magnitude $F = |q| v B \sin \theta$; direction given by first right-hand rule, taking current to be in direction of \vec{v} for a positive charge, $-\vec{v}$ for a negative charge.

(2) Know how to use second right hand rule to determine the direction of the magnetic field of a current at a nearby point in space. Know how to determine the direction of the forces between different circuits, and whether the forces are attractive or repulsive.

(3) Know how to determine the net force and the net torque on a rectangular loop with straight sides. If there is a net torque, know how to determine which way the loop will rotate due to this torque.