PES 1000 –Physics in Everyday Life – Evaluation Overview

UNIT 3: (Chapters 12 – 14) Electric Charge, Circuits, Magnetism

Griffith 'The Physics of Everyday Life' 8th.ed.

Definitions

- Charge, conductor & insulator, polarized vs. ionized, conservation of charge, electric field, electric field lines, equipotential lines, electric dipole, protons and electrons
- Current, resistance, battery & electromotive force, series & parallel, AC & DC current, power (supplied & used), capacitors
- Magnetic poles, monopoles, magnetic field lines, electromagnet, magnetic force & the right-hand rule, transformers
- ~~Longitudinal & transverse, period, frequency, wavelength, periodic waves, interference, standing waves, node & anti-node, fundamental frequency & higher harmonics, speed of sound in materials, pitch, Doppler Shift, resonance~~

Units

- Charge (coulomb, or C), electric field (N/C), voltage (volts, or V), electric force (N)
- Current (ampere, or A), resistance (Ohm, or Ω), electromotive force (volts, or V), power (watts, or W)
- Magnetic field strength (Tesla, or T, and Gauss, or G), magnetic force (N)
- ~~Period (s), frequency (Hz), wavelength (m)~~

Relationships

- **Electric Force**, electric field & charge; **Electric Force**, two charges & distance between;
- **Current**, charge & time; **Resistance**, current and voltage; batteries or resistors connected in series or parallel; **Power loss**, resistance & current
- **Magnetic Force**, field strength, charge & speed; Current & voltage in primary and secondary loops in a transformer
- ~~**Wavelength**, frequency & speed; **Period** & frequency; Wave speed & string density; Speed of sound & density of material; Sound source speed & pitch (Doppler)~~

Applications

- Lightning; Air cleaners, Parallel charged plates; Fluorescent tubes
- Simple circuit (battery & resistor); water analogy; lifetime & voltage for batteries connected in series or parallel; the water analogies to charge
- Electromagnets; electric motors & generators; transformers; inductive sensors
- ~~Vibrating strings [transverse waves]; sound waves [longitudinal waves]; standing waves in strings, pipes, & flutes; resonance in the shower~~

The following list of equations will be provided on the last page of the traditional multiple-choice exam.

- $F_E=k*q_1*q_2/r^2$, $E=F_E/q$
- $\Delta V=I*R$, $I=\Delta q/\Delta t$, $Power_{Supplied}=\Delta V*I$, $Power_{Used}=I^2*R$, $R_{equivalent}=R_1+R_2$ [for series circuits], $R_{equivalent}=1/(1/R_1+1/R_2)$ [for parallel circuits]
- $F_B=B*q*v$ (if B and v are perpendicular); For transformers, $\Delta V_{secondaryt}=(N_{secondary}/N_{primary})*\Delta V_{primary}$, and $I_{secondary}=(N_{primary}/N_{secondary})*I_{primary}$
- ~~$v=f*\lambda$ (mechanical waves), $T=1/f$, v=square_root(tension/density)~~

R=resistance, I=current, E=electric field strength, B=Magnetic field strength, F=force, q=charge, ΔV=voltage, L=length, v=speed, t=time, N=no. of loops, r=distance between charges, ~~λ=wavelength, T=Period, f=frequency~~