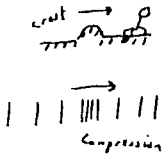
Review for last section of course - Waves, Light, Modern

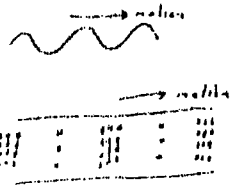
(About 1/3 of Test)

REVIEW for Tomorrows WAVES Quiz

1) Know what a wave is - What way will points on wave move -

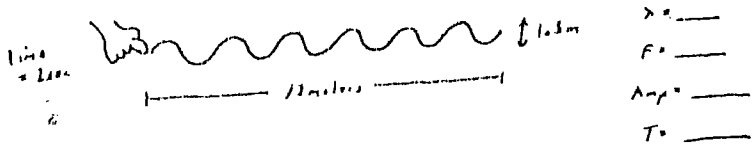


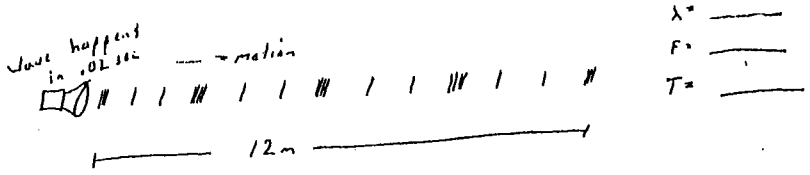
2) Basic Transverse versus Longitudnal wave.



3) Characteristics of a wave -

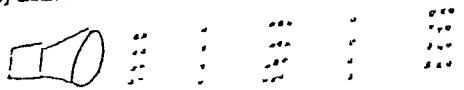
(frequency, wavelength, amplitude, period, velocity)



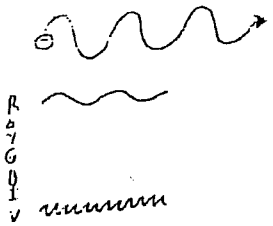


4) Wave Equation -

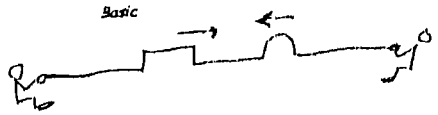
5) Sound waves -



6) Light Waves - (Also called electromagnetic waves or radiation)



7) Interference of waves -

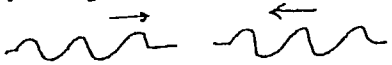


7) Continued :

Constructive

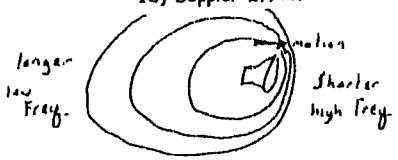
Destructive

8) Standing waves -



9) Resonance & Natural frequency -

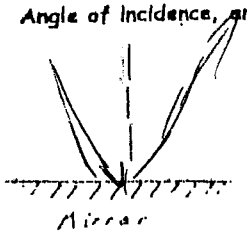
10) Doppler Effect -



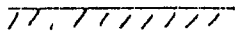
REVIEW for
REFLECTION REFRACTION

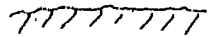
REFLECTION REFRACTION

1) Basic law of Reflection, Where is Normal line, Where is Angle of Incidence, and Angle of reflection.



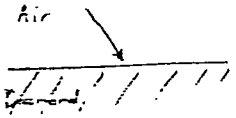
2) Two extremes of reflection.

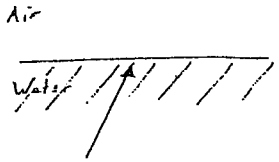




3) Images formed in Plane mirrors.

4) What is Refraction, How will light rays bend when traveling from less to more dense, or more to less.

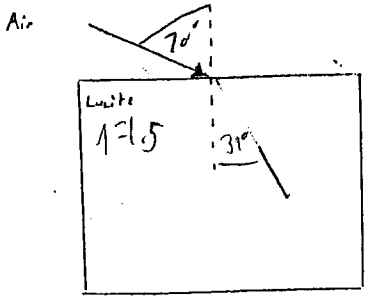




5) Index of refraction. What it means, and how to use Index equation.

6) SNELL'S LAW for REFRACTION.

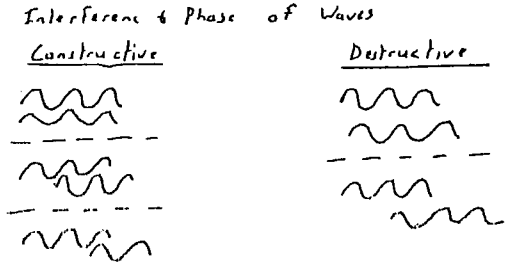
- Where is normal line.
- Identify incident and refracted rays
- Where are angles of incidence and refraction
- Set up and solve equation



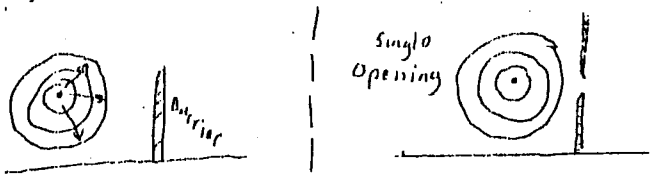
REVIEW for DUAL NATURE of LIGHT

Wave Nature

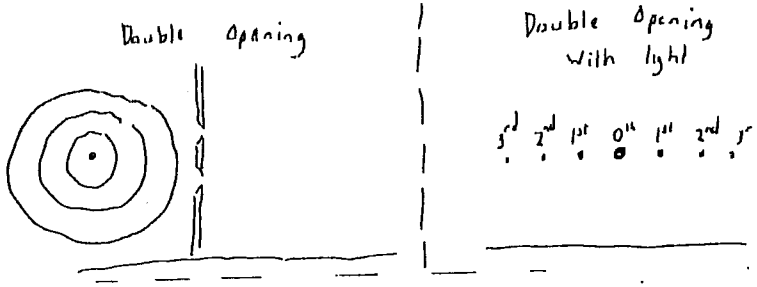
1) Know constructive and destructive interference and phase relationships possible for each.



2) Know diffraction is a wave quality



3) Know double opening diffraction & interference for wave fronts. If Light does this what pattern is produced on the screen?



Particle Nature -

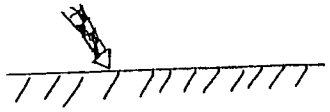
1) Know particles of light are called photons or quanta. Who first proposed this idea. Compare and contrast: Intensity (brightness) of a light beam and frequency (wavelength or color) From the two points of view or models of light (Wave Model vs. Particle Model.

2) What is the equation for the energy of a Photon of light. Be able to convert from joules of energy to electron volts, and vice versa

3) Describe the Photoelectric Effect experiment and its importance.

Photon - Color = Freq. or wavelength

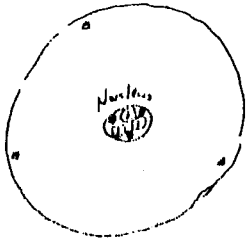
Brightness = # of photons



4) Know conservation principles applied in Photon Electron collisions.

Review for Atomic Structure

1) Understand the Basic "Planetary Model" of the atom. Where are the Protons & Neutrons, Where are the Electrons. What is the charge In Coulombs of a Proton, or Electron, What is the mass of each?



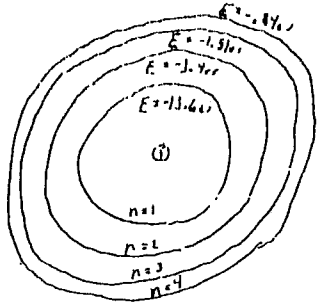
q_{proton} =

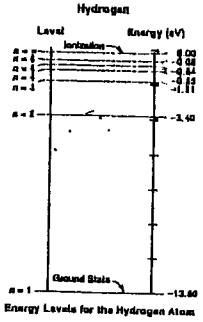
$q_{electron}$ =

m_{proton} =

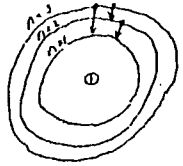
$m_{electron}$ =

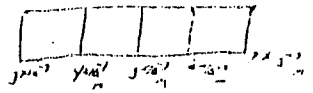
2) What was the newer Bohr Model of the atom? What problems did this model solve? What does the negative energy at each allowed energy level state mean? When absorbing energy the electron can totally break free or just jump into a higher level, Be able to figure out how much needs to be absorbed for these processes.



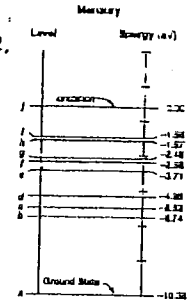


3) When atom starts from a higher "excited" energy level state it eventually falls back down and makes the bright line spectrum by giving off photons. Be able find the energy of these photons in electron-Volts and switch over to Joules. Be able to use $E=hf=h(c/\lambda)$ to find frequency wavelength or color.



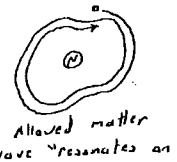


4) Be aware you could get the Mercury atom. Instead of n=1, n=2, It's a, b, c but everything else is the same.

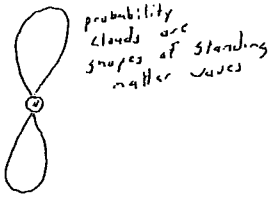


A Few Energy Levels for the Mercury Atom

5) Know Matter Waves, & The Uncertainty Principle a little. Know how These ideas lead into allowed and disallowed energy levels, and probability cloud model of atom.

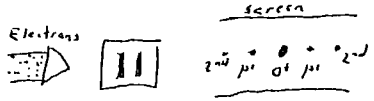


Allowed matter wave "resonates on itself"



probability clouds are shapes of standing matter waves

6) Know small sub-atomic particles can be shown to do diffraction & interference which shows they have a wave quality



Nuclear & Standard Model Review

1) Know all Nuclear ideas are based around Einstein's idea that energy can convert to matter or matter to energy by famous equ. $E=mc^2$ When using this formula it will be in kg of mass & Joules of energy.

2) You can also do matter energy conversion process using the conversion factor for universal mass units (1u = 931 Mev).

3) Inside the nucleus of the atom if you mass the individual parts and add them up you will get slightly more mass than the nucleus as a whole. This missing mass changes into energy that holds the nucleus together. (mass defect, & binding energy). Be aware of how fundamental forces in the universe compare (Gravitational, Electro-Magnetic, Strong & Weak Nuclear)

$^{6}_{3}Li$ mass = 0.95×10^{-26} Kg

proton mass = 1.67×10^{-27} Kg

Neutron mass = 1.67×10^{-27} Kg

4) Understand how to find energy produced in certain famous reactions –

Fission –

$^{235}_{92}U + ^{1}_{0}n \rightarrow ^{141}_{56}Ba + ^{92}_{36}Kr + 3(^{1}_{0}n) + Energy$

Fusion –

$^{2}_{1}H + ^{1}_{1}H \rightarrow ^{3}_{2}He + Energy$

Alpha Decay –

$^{237}_{92}U \rightarrow ^{4}_{2}He + ^{233}_{90}Th$

Beta Decay –

$^{234}_{90}Th \rightarrow ^{0}_{-1}e + ^{234}_{91}Pa$

5) Matter – AntiMatter Reactions, How to do balance (or conservation) of Charge in a reaction. (-1e = charge on electron, +1e=charge on proton or antielectron)

positron (+e) ⟵ electron (-e)

particles annihilate + give total Energy

6) Undertand idea of Standard Model of matter. How do Quarks and Leptons tie into the model