Particle Physics

matter is made up of 17 fundamental particles

these particles are categorized based on their properties

Light Quiz

- Diffraction
  - interference
- polarization
  - what it is
  - how it occurs (4 ways)
    - reflection
    - scattering
    - double diffraction
    - filtering (polarizing filters)
  - diagram what is happening
  - how can this show the quantum nature of light
    - light is both a wave and a particle
    - comes in distinct packets of energy
  - Single slit: calculate: explain
  - thin film: why does it result in diffraction?
    - calculate λ or thickness
  - General properties of light
    - Wien's law $\rightarrow$ find peak λ or temp of peak λ
  - Discussion Questions from lab
  - photoelectric effect
    - work function
      - determining E_k

10 multiple choice 2 explain questions 3 full answer questions

the light lab showed quantum nature of light as different colours of light require different voltages

Thin Film

when light contacts a thin clear film, some of the light will be refracted and some will be refracted. Some of that refracted light will hit the second boundary and will reflect back out.

$air \rightarrow n = 1$

$bubble \rightarrow n > 1$

when light reflects off a slow medium from a fast medium, it will invert. $\therefore$ the light that is bouncing off the top layer will be $\frac{\lambda}{2}$ out of phase from the light passing through the bottom medium.

Thus in order to cause constructive interference, the light passing through must pass total a $\frac{\lambda}{2}$, so the width of the medium must be $\frac{\lambda}{4}$. Some with destructive. In order for the light to totally delete itself, the light must maintain it's $\frac{\lambda}{2}$ wavelength phase shift, so the width of the medium must be λ

this all changes if the medium on the inside of the bubble is slower than the medium the bubble is made of, as in this means there would be a double reflection.

Example Find the min thickness of a bubble ($n = 1.4$) that can produce a maximum brightness for 540 nm light in air.

for bubble min thickness for constructive is found at $\frac{\lambda}{4}$

find λ in the bubble

$$\frac{n_1}{n_2} = \frac{\lambda_2}{\lambda_1}$$
$$\lambda_2 = \frac{\lambda_1 n_1}{n_2}$$
$$= 3.857.71nm$$

find thickness

$$t = \frac{\lambda_2}{4}$$
$$...$$

whats the angle to the 3rd maxima for a single slit diffraction pattern where the screen is 2.7 m from a 0.14 mm slit that has 350 nm light waves passing through it.

$L = 2.7$

$W = 0.15 \times 10^{-}3m$

$\lambda = 350 \times 10^{-}9m$

$m = 3$

$$wsin\theta = (m + 0.5)\lambda$$
$$theta = \sin^{-1}(\frac{(m + 0.5)\lambda}{w})$$
$$0.47^o = \theta$$