1. [4/20] In the graph, data representing the percentage of hamster ovary cells surviving Ultra violet exposure is shown, for different lasers .

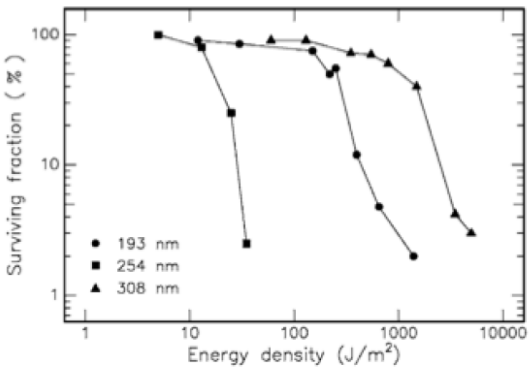

Fig. 3.38. Surviving fraction of Chinese hamster ovary (CHO) cells after UV irradiation. Light sources: ArF laser (193 nm), Hg lamp (254 nm), and XeCl laser (308 nm). Data according to Rasmussen et al. (1989)

[Niemz]

a) what is the reason for such a different impact in surviving cells percentage for the 3 tested lasers?

b) describe the photoablation process and refer its relevance in medical applications.

c) how to chose a UV laser for photoablation minimizing colateral effects?

1. [2] A collimated laser beam at 632.8 nm, 3 mm beam waist and 1 mW optical power, addresses the cornea.
   a) Estimate the power of red radiation incident on the retina;
   b) Calculate the irradiance at the retina, assuming a diffraction limited spot at fully dilated pupil (aperture of 7 mm).

Group II

1. [4] An Ho:YAG laser (10 mJ pulse energy, 2.1 μm emission, pulse duration 350 μs) is delivered to myocardium tissue (absorption coefficient of $\mu_a = 165\ \text{cm}^{-1}$). The laser beam section is 1 mm^2. The myocardium is initially at 37°C. For a total laser exposure of 0.742 s:
   a) what is the maximum final myocardium temperature?
   b) what is the physical process involved?
   c) what histopathological effect is expected to be seen in the exposed myocardium?
   d) Estimate the ratio of surviving cells for this exposure, considering that the death activation energy is 5×10^5 J/mol, and the frequency factor is $10^{76}\ \text{s}^{-1}$.
2. [2] Describe the LITT procedure, identifying the relevant physical light-tissue interaction mechanism.

1. Em aplicações ópticas em biociências:

   (a) o que se entende por *Janela Terapêutica?*

   (b) que parâmetros definem a localização dessa janela?

2. Descreva, indicando em que situações físicas se tornam mais relevantes, os dois processos de espalhamento de radiação conhecidos como

   (a) Espalhamento de Rayleigh;

   (b) Espalhamento de Mie;

2. Descreva o processo físico de fotoablacção, e contraponha com o processo de ablação térmica, enumerando as principais características dos dois processos.