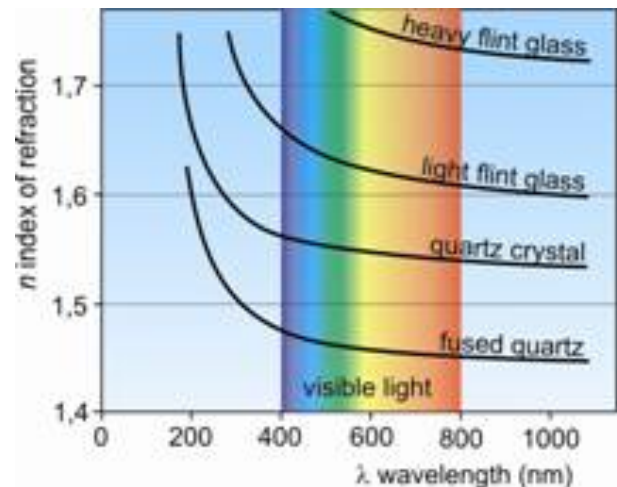


## Refractometry

- 2.10. The speed of light in a given medium is 25% less than in vacuum. Calculate the absolute refractive index of the medium.
- 2.11. What is the speed of light in diamond ( $n_{\text{diamond}} = 2,417$ )?
- 2.12. A ray of light coming from the air reaches the water surface at  $70^\circ$  angle of incidence. Part of the ray enters the water.  
 a) Calculate the angle of refraction of the ray entering the water.  
 b) Find the angle formed by the refracted and reflected rays.
- 2.13. A ray of light coming from the air reaches the water surface at grazing angle (i.e.  $90^\circ$ ). Find the angle of refraction for the ray entering the water.
- 2.14. Calculate the angle of total reflection if light enters from glass ( $n_{\text{glass}} = 1.5$ ) into water.
- 2.15. Distilled water is filled between the prisms ( $n_{\text{prism}} = 1.739$ ) of a refractometer,  
 a) Calculate the critical angle.  
 b) How does the critical angle change if – instead of water – the blood plasma of a healthy person (with 70 g/L protein concentration) is filled between the prisms? The index of refraction of blood plasma depends on the protein concentration according to the following equation:  $n_{\text{plasma}} = 0.0001975 \text{ L/g} \cdot c_{\text{protein}} + 1.3348$ .  
 c) How much less is the speed of propagation of light in the measuring prism than in distilled water (in percentage)?

- 2.16. The figure shows the dispersion characteristics of different kinds of glass. White light coming from the air reaches the surface of light flint glass at  $60^\circ$ . Using data from the figure, calculate the difference between the angles of refraction of the violet ( $\lambda = 400 \text{ nm}$ ) and red ( $\lambda = 800 \text{ nm}$ ) components of the incident light.



- 2.31. Calculate the limits of the frequency range of visible light in THz units.
- 2.32. A blue ray of light of 720 THz frequency enters the water from air. Calculate  
 a) the wavelength of the light in air,  
 b) the frequency of the light in water, and  
 c) the wavelength of the light in water.  
 d) What will be the color of this light for an observer in the water?

## Solutions

2.10. **1.333**

2.11. **1.24E8 m/s**

2.12. a) **44° 50'**  
b) **65° 10'**

2.13. **48° 36'**

2.14. **62° 42'**

2.15. a) **50° 3'**  
b) **50° 51'**  
c) **23.4%**

2.16. **approx. 1.09°**

2.31. **375 THz - 750 THz**

2.32. a) **417 nm**  
b) **720 THz**  
c) **313 nm**  
d) **the same blue**