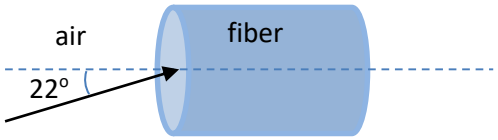
1- (a) Draw electromagnetic spectrum and label the regions according to wavelength of radiation
(b) Write equation relating the energy of electromagnetic radiation to its wavelength and frequency, and also compare the relative energies of visible light, ultraviolet light and infrared radiation.

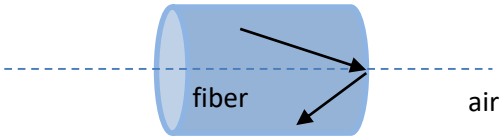
2- If ordinary light is transmitted from air into a 1 cm thick sheet of polymethacrylate (n=1.5), is the light sped up or slowed down upon entering the plastic? Explain.

3- Explain why cut diamonds sparkle.

4-
(a) Light travels from air into an optical fiber with an index of refraction of 1.44. If the angle of incidence on the end of the fiber is 22°, what is the angle of refraction inside the fiber?



(b) Suppose that light travelling in optical fiber. What is the critical angle for light to be totally reflected when leaving fiber and entering the air.



5- Explain why gold is yellow in color and silver is ‘’silvery’’.

6- Ordinary light strikes the flat surface of a transparent material with a linear absorption coefficient (α) of 0.04 cm^{-1}. If the plate of the material is 0.80 cm thick, calculate the fraction of light absorbed by the plate.

7- Calculate the transmittance for a flat glass plate 6.00 mm thick with an index of refraction (n) of 1.51 and linear absorption coefficient (α) of 0.03 cm^{-1}.

8- Explain the luminescence effect operating in a fluorescent lamp.

9- (a) Show the basic elements of an optical-fiber communication system and describe the function of each element briefly.
(b) What types of impurities are detrimental to light loss in optical fibers?
(c) How do GeO_2 and F affect the refractive index of the silica glass?
(d) How is light loss minimized in optical fibers? Explain showing the structure of fibers.

10- What is the significance of T_c, H_c, and J_c for a superconductor?

11- Describe Meisner effect and the difference between type I and type II superconductors.

12- What is the origin of magnetism and how do we observe magnetic field lines?

13- Define Magnetic permeability, Magnetic Susceptibility.

14- What are the types of magnetism? Define each of them.

15- What are the well known metallic ferromagnetic materials? Why do they display ferromagnetic behavior? Explain in terms of electronic structure.

16- How temperature effects ferromagnetic behavior?

17- What is magnetic domain and how are they effected from external field(H)? Use proper drawings.

18- How most stable domain structure is obtained in a ferromagnetic material?

19- Define total potential energy of a ferromagnetic material. Write down each components affecting total potential energy.

20- Draw hysteresis loop of a magnetic material and define each critical point on the curve.

21- Compare and contrast hysteresis loops of hard and soft magnetic materials? Give examples for hard and soft magnetic materials.

22- Discuss the effect of magnetic annealing on magnetic behavior of ferromagnetic materials.