1. Select the correct statement:
   A) ultraviolet light has a longer wavelength than infrared
   B) blue light has a higher frequency than *x* rays
   C) radio waves have higher frequency than gamma rays
   D) gamma rays have higher frequency than infra-red waves
   E) electrons are a type of electromagnetic wave

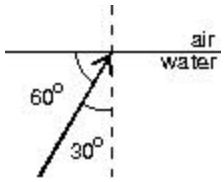
2. The order of increasing wavelength for blue (b), green (g), red (r), and yellow (y) light is:
   A) r, y, g, b
   B) r, g, y, b
   C) g, y, b, r
   D) b, g, y, r
   E) b, y, g, r

3. A point source emits electromagnetic energy at a rate of 100 W. The intensity 10 m from the source is:
   A) 10 W/m^2
   B) 1.6 W/m^2
   C) 1 W/m^2
   D) 0.024W/m^2
   E) 0.080 W/m^2

4. Light with an intensity of 1 kW/m^2 falls normally on a surface with an area of 1 cm^2 and is completely absorbed. The force of the radiation on the surface is:
   A) 1.0×10^{-4} N
   B) 3.3×10^{-11} N
   C) 1.7×10^{-10} N
   D) 3.3×10^{-10} N
   E) 6.7×10^{-10} N

5. A clear sheet of polaroid is placed on top of a similar sheet so that their polarizing axes make an angle of 30° with each other. The ratio of the intensity of emerging light to incident unpolarized light is:
   A) 1:4
   B) 1:3
   C) 1:2
   D) 3:4
   E) 3:8

6.If $n_{water} = 1.33$, what is the angle of refraction for the ray shown?



A) 19°
B) 22°
C) 36°
D) 42°
E) 48°

7. A ray of light passes obliquely through a plate of glass having parallel faces. The emerging ray:
   A) is totally internally reflected
   B) is bent more toward the normal than the incident ray
   C) is bent further away from the normal than the incident ray
   D) is parallel to the incident ray but displaced sideways
   E) lies on the same straight line as the incident ray

8. The index of refraction of benzene is 1.80. The critical angle for total internal reflection, at a benzene-air interface, is about:
   A) 56°
   B) 47°
   C) 34°
   D) 22°
   E) 18°

Answer Key --

1. D
2. D
3. E
4. D
5. E
6. D
7. D
8. C