

Quiz 6 Version C

- 1) You look at the center of one face of a solid cube of glass, on a line of sight making a 55 degree angle with the normal to the cube surface. What is the minimum refractive index of the glass for which you will see through the opposite face of the cube? Assume the cube is surrounded by air with $n=1$.
a) 1.8 b) 1.6 c) 1.5 d) 1.4 e) 1.3

- 2) A 1.0 Watt sound source emits uniformly in all directions. What is the decibel level 12m from the source?
a) 10dB b) 30dB c) 50dB d) 70 dB e) 90 dB

- 3) Information in a compact disk is stored in “pits” whose depth is essentially $\frac{1}{4}$ of the wavelength of the red laser light used to “read” the information. That wavelength is 780nm in air. The wavelength on which the pit depth is based on is however measured in a plastic with $n=1.55$. What is the pit depth?
- a) 780nm b) 195nm c) 150nm d) 125nm e) 105nm
- 4) Total internal reflection occurs at an interface between a plastic and air at incidence angles larger than 37 degrees. What is the refractive index of the plastic?
- a) 1.70 b) 1.66 c) 1.62 d) 1.58 e) 1.54

- 5) A supersonic plane flies directly over you at 2.2 times the speed of sound. You hear its sonic boom 22 sec after it passes you overhead. What is the plane's altitude? (Speed of sound = 340 m/sec)
- a) 7.0 km b) 7.2 km c) 7.4 km d) 8.4 km e) 9.3 km
- 6) What is the speed of light in a material for which the critical angle at an interface with air is 61 degree? Assume the speed of light is 3×10^8 m/s.
- a) 2.0×10^8 m/s b) 2.2×10^8 m/s c) 2.4×10^8 m/s d) 2.8×10^8 m/s e) 2.6×10^8 m/s
- 7) Light is incident on an air-glass interface, and the refracted light in the glass makes a 40 degree angle with the normal to the interface. The glass has refractive index $n=1.52$. What is the incidence angle?
- a) 20 degrees b) 40 degrees c) 60 degrees d) 80 degrees e) 10 degrees

8) A scuba diver sets off a camera flash a distance of 2m below the surface of water with refractive index $n=1.33$. Assume air has refractive index $n=1$. What is the diameter of the circle at the surface of the water through which light emerges?

a) 3.0m b) 3.5m c) 4.0m d) 4.5m e) 5.0m

9) What is the total opening angle of the sonic boom cone for a supersonic plane traveling at Mach 2.5 ?

a) 12 degree b) 24 degree c) 36 degree d) 48 degree e) 60 degree

10) A cylindrical tank 2.4m deep is full to the brim with water ($n=1.33$). Sunlight first hits part of the tank bottom when the rising sun makes a 22 degree angle with the horizon. What is the tank's diameter? (Assume the tank brim is level with the horizon)

a) 2.12m b) 2.21m c) 2.33m d) 2.40m e) 2.53m