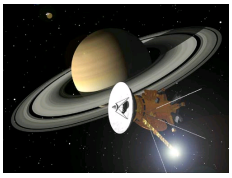
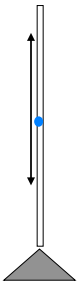
NASA's Cassini probe orbits Saturn, and radios earth at a frequency of 8 GHz (8×10^9 Hz). If Cassini doubles the frequency to 16 GHz, the time required for the radio signal to travel from Cassini to Earth will

A) Increase
B) Decrease
C) Remain constant
D) Not enough info



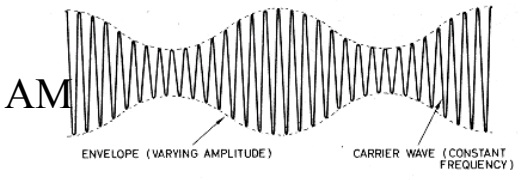


If electrons oscillate up and down more times per second (higher frequency), the wavelength of the radio wave will:

a. Increase b. Decrease
c. Stay the same.

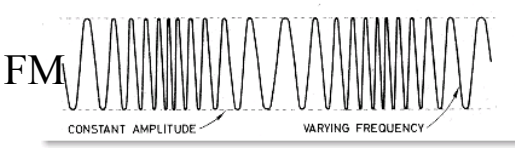
A radio wave of wavelength 2 meters passes by a person with a radio receiver. E and B go up and down as the wave travels past.
After 1 second, the number of waves that moved past the person is:

A) 1 wave
B) 3E8 waves
C) 1.5E8 waves
D) 6E8 waves
E) None of these!



Amplitude Modulation

Frequency Modulation

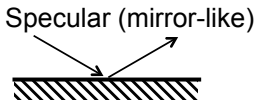


Under cover of night, a Girl scout signals her friends on a distant hill by alternately placing slabs of red or green Jell-O over her flashlight. This signal is most accurately described as..

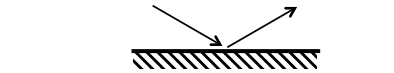
A: Amplitude modulation.
B: Frequency modulation.

How many solar collectors would you need to replace a 4 kW hot water heater?
Useful facts:
Solar thermal panels are ~ 50% efficient.
Typical solar panels are ~1m x 2m
Sunshine in Boulder delivers ~ 1 kW/m^2

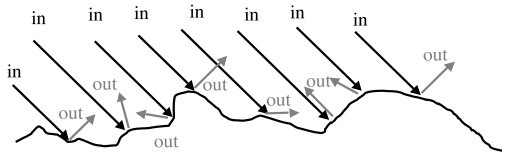
A) 1 panel B) 2 panels C) 4 panels
D) 8 panels E) This will never work



Specular (mirror-like)



versus Diffuse

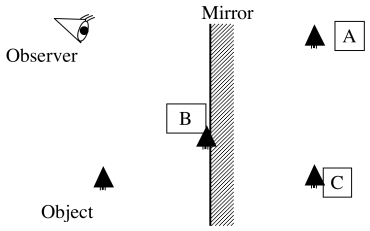


Look around the room. You can see lots of ordinary objects. *Why* can you see them?

A) They generate light.
B) They reflect bulb-light: the primary mechanism is specular reflection.
C) They reflect bulb-light: the primary mechanism is diffuse reflection.
D) You just see them, they are not emitting or reflecting any light.

If I shine my laser pointer at the white screen, is the reflected light primarily
A) Specular
B) Diffuse

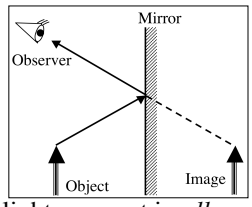
Which point best indicates where the observer would *perceive* the image?



D) None of these!

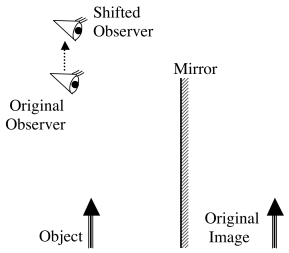
Which is true?

A) There is only 1 ray of light from object to observer (I drew it!)



B) Only the tip of the object emits light. That light goes out in *all* directions. I drew 1 ray to keep the picture simple.

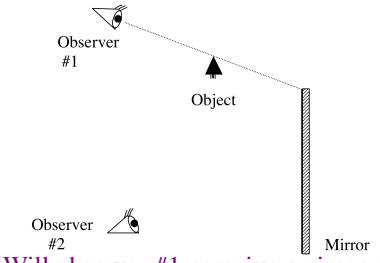
C) *All* points on the object emit light, in *all* directions. I drew 1 ray to keep it simple.



Which is true when the observer shifts a bit?

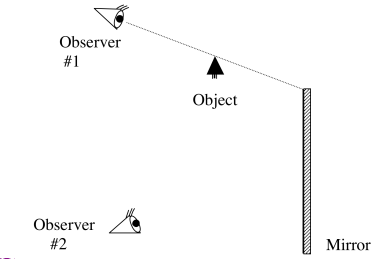
A) Perceived image position shifts a little

B) Perceived image remains in one place



Will observer #1 perceive an image in the mirror?

A) Yes B) No C) ???



Will observer #2 perceive an image in the mirror?

A) Yes B) No C) ???