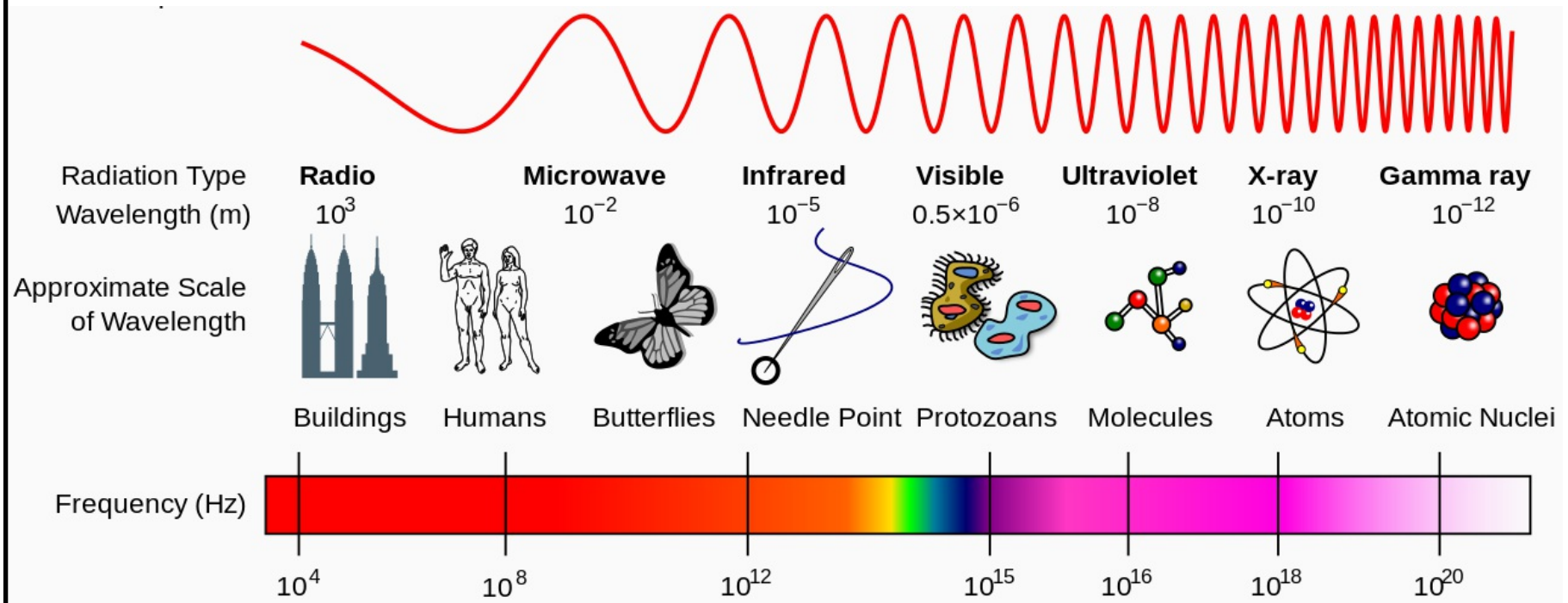
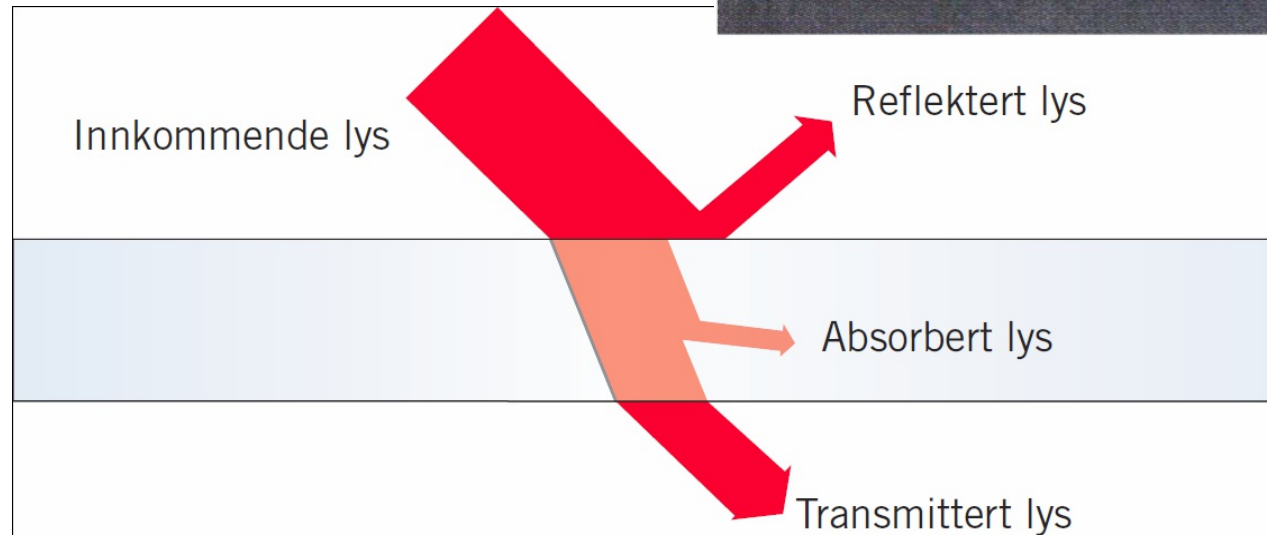
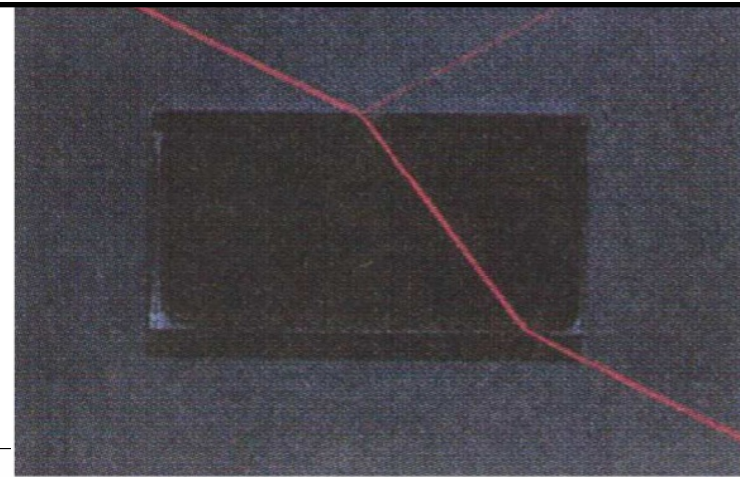


Lys

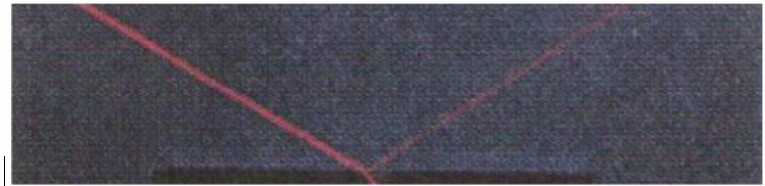
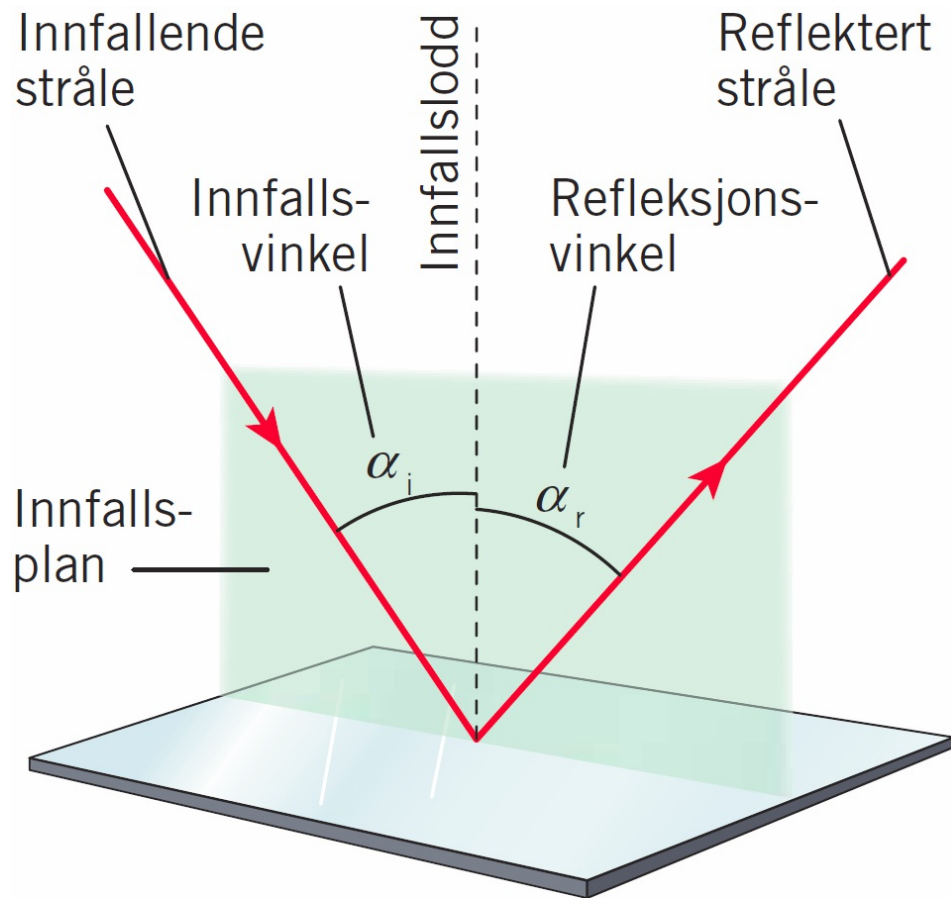
Elektromagnetisk spektrum



Lys gjennom glassprisme

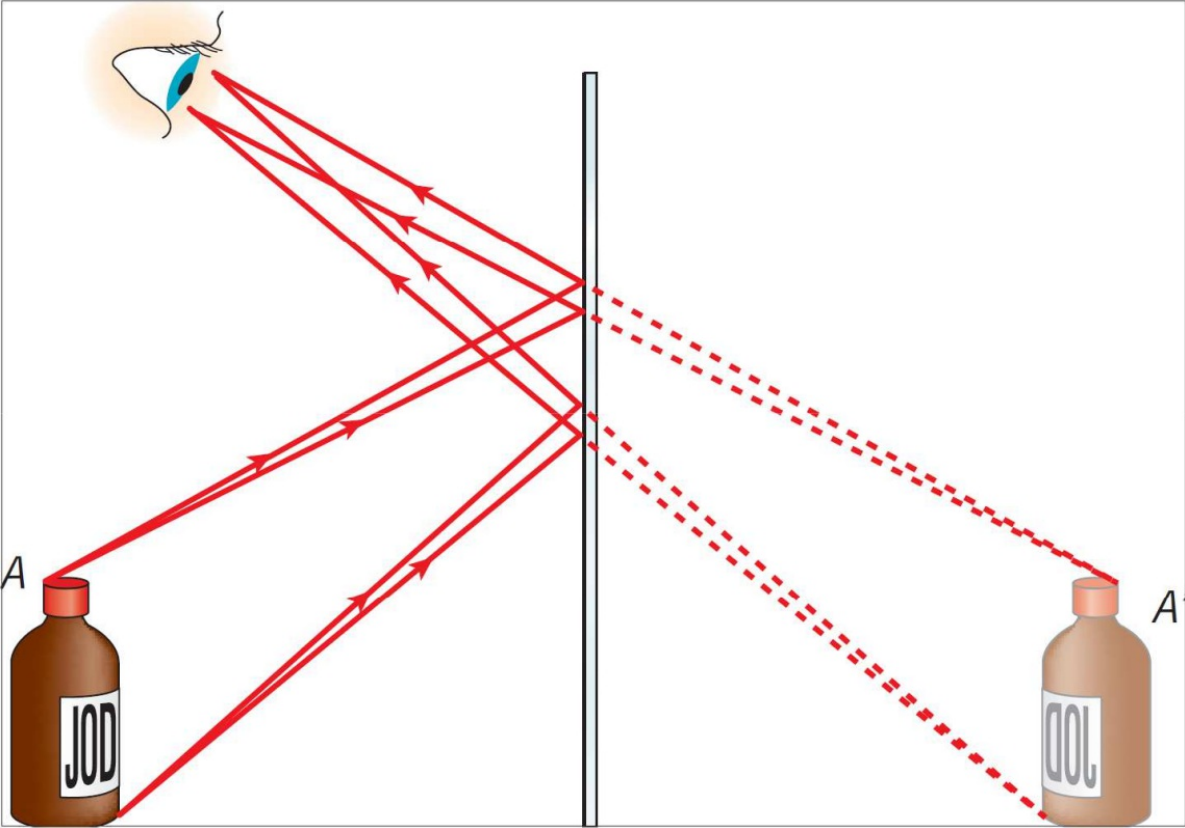


Refleksjon

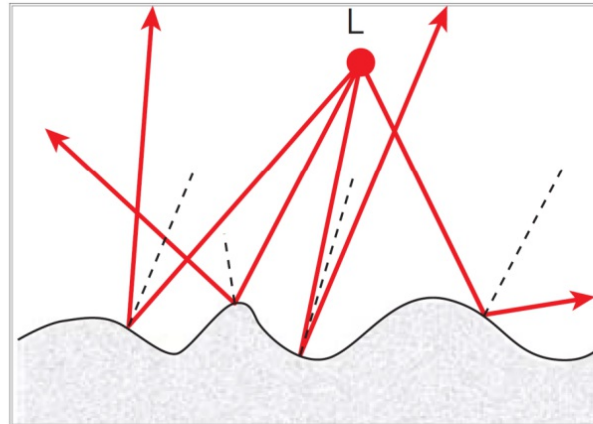


$$\alpha_r = \alpha_i$$

Speilbilde



Diffus refleksjon

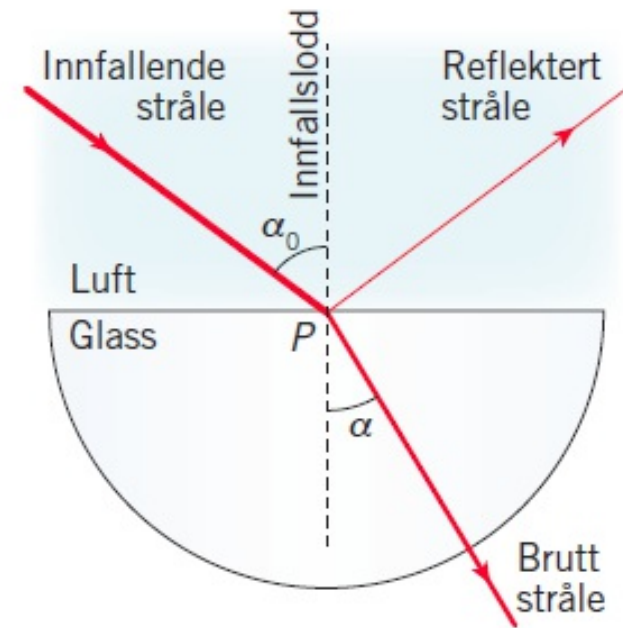
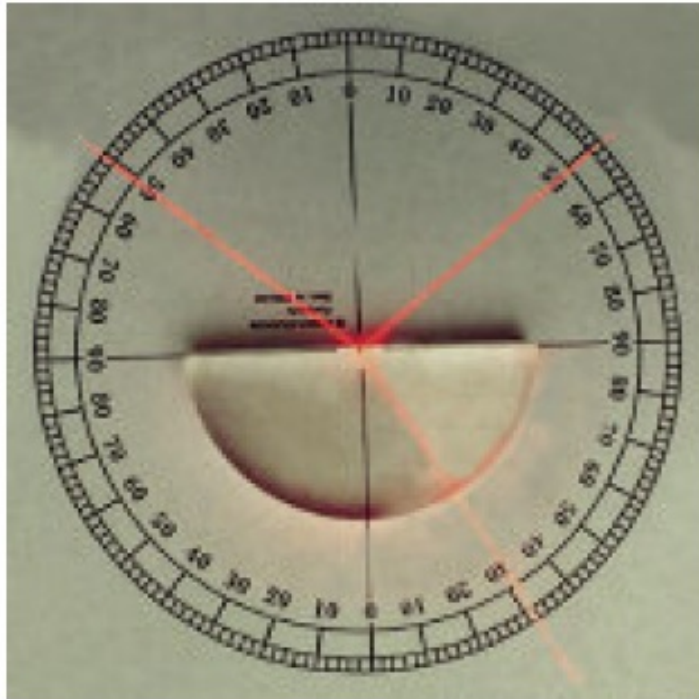


«perfekt»

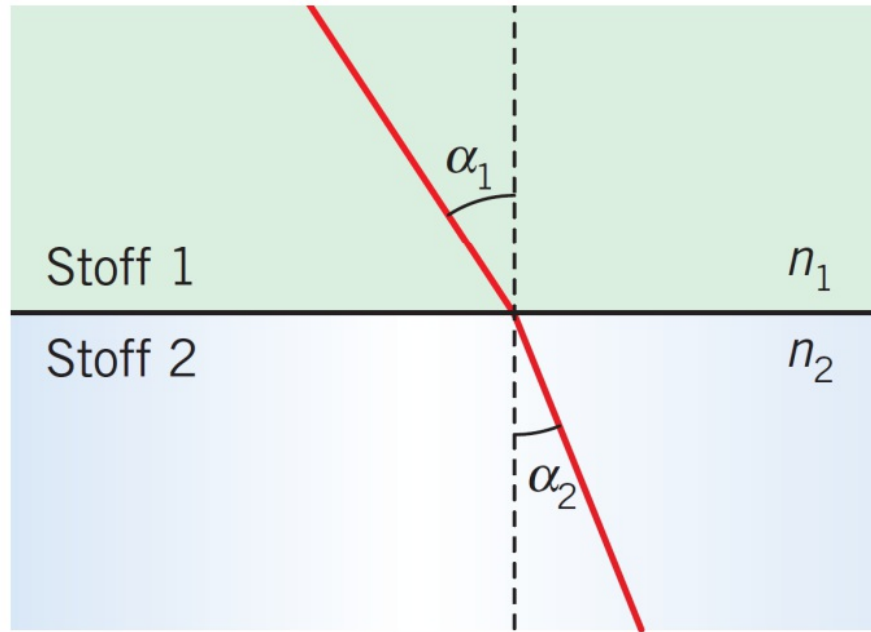
diffus



Brytning



Snells brytningslov



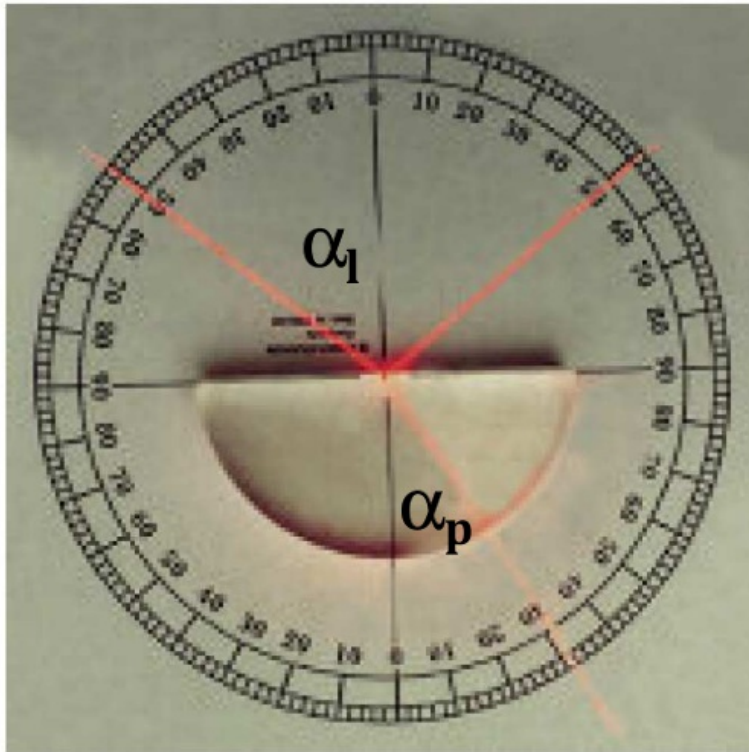
$$n_1 \sin \alpha_1 = n_2 \sin \alpha_2$$



Brytningsindeks for noen stoffer

Luft	1,0003
Vann	1,33
Is	1,31
Pleksiglass	1,48
Kronglass	1,51
Kvartskrystall	1,54
Plast (polystyren)	1,59
Flintglass	1,61
Diamant	2,42

Snells brytningslov: Eksempel



$$n_1 \sin \alpha_1 = n_p \sin \alpha_p$$

1: luft, $n_1 \approx 1.00$

2: pleksiglass $n_p \approx 1.50$

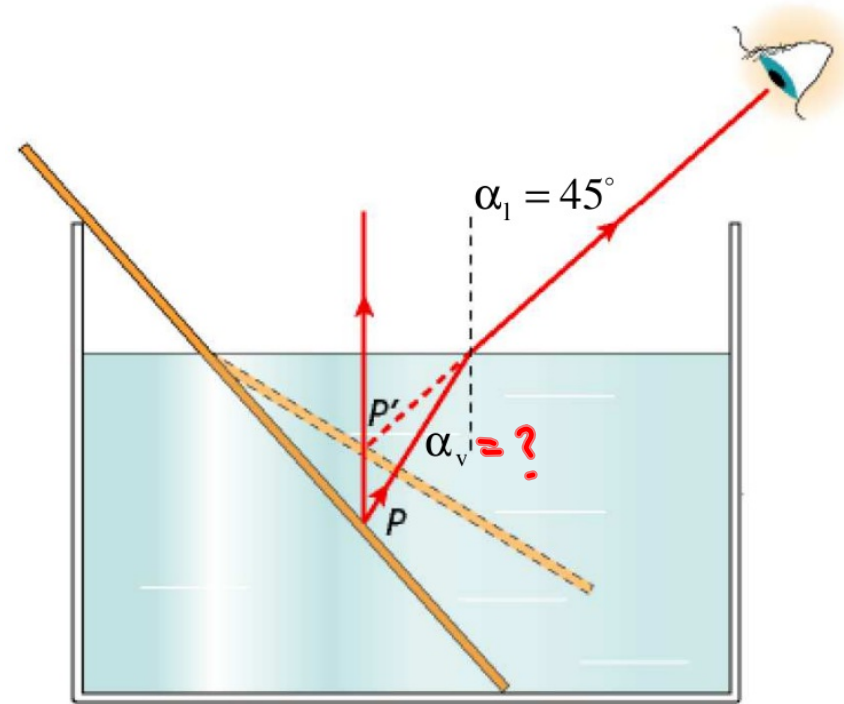
$$\alpha_1 = 50^\circ$$

$$\alpha_p = ??$$

$$\sin \alpha_p = \frac{n_1 \sin \alpha_1}{n_p} = 0.51$$

$$\alpha_p = 31^\circ$$

Snells brytningslov: Eksempel



$$n_1 = 1$$

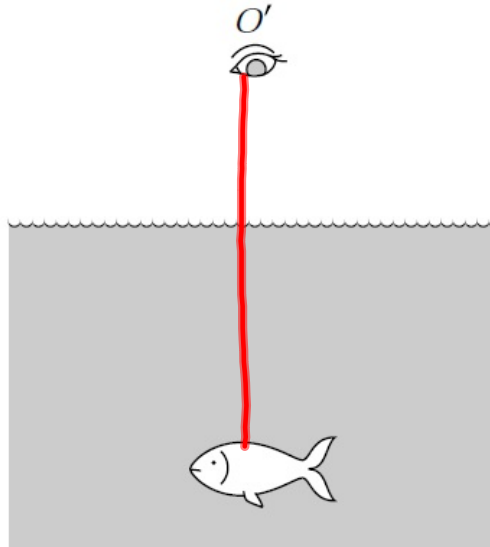
$$n_2 = 1,33$$

$$n_1 \sin \alpha_1 = n_2 \sin \alpha_2$$

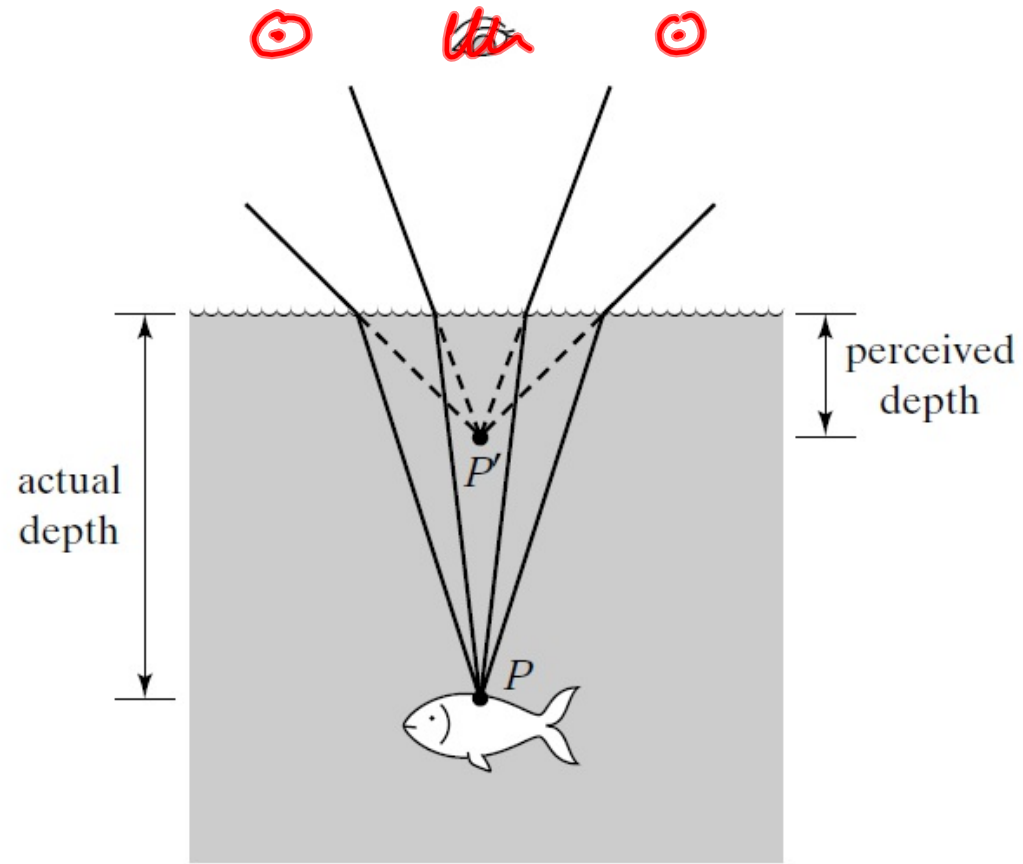
$$\sin \alpha_2 = \frac{n_1 \sin \alpha_1}{n_2} = 0,53$$

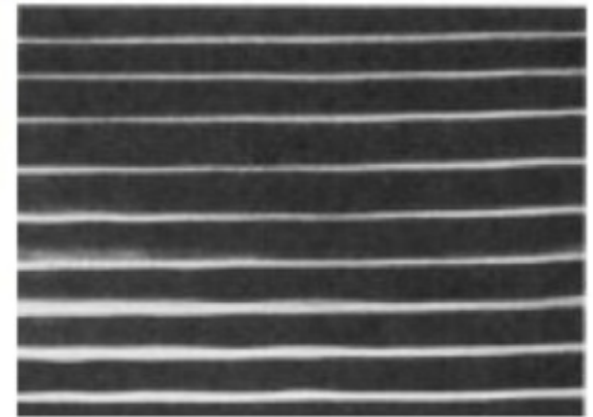
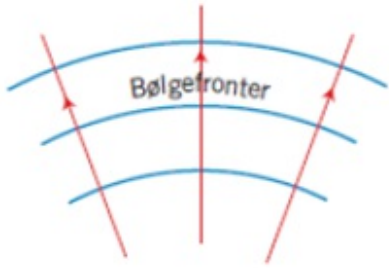
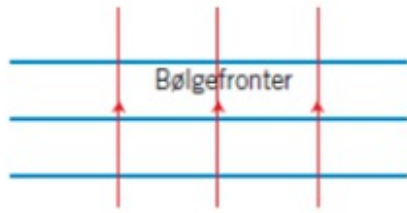
$$\alpha_2 = 32^\circ$$

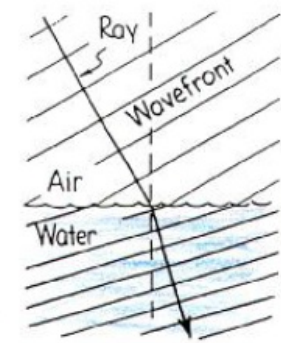
A fish swims below the surface of the water. Suppose an observer is looking at the fish from point O' —straight above the fish. The observer sees the fish at



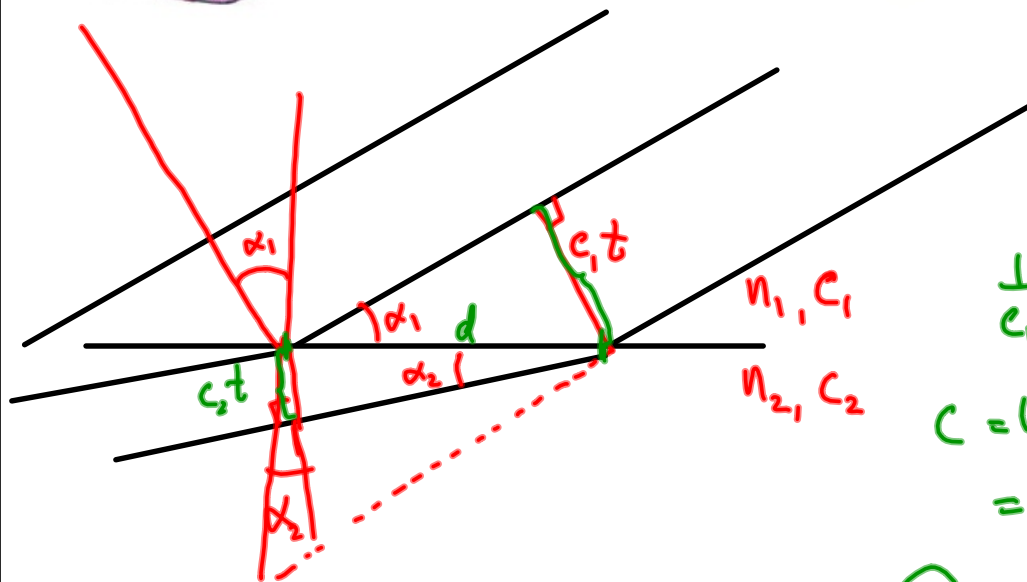
1. a greater depth than it really is.
2. the same depth.
3. a smaller depth than it really is.







Lys blir brutt på grunn av forandring i bølgefart



$$\frac{c_1 t}{d} = \sin \alpha_1$$

$$\frac{c_2 t}{d} = \sin \alpha_2$$

$$\frac{1}{c_1} \sin \alpha_1 = \frac{1}{c_2} \sin \alpha_2$$

$c = \text{lyshastighet i vakuum}$
 $= 3,0 \cdot 10^8 \text{ m/s}$

Vann : $n_v = 1,33$

$$\frac{c}{c_v} = 1,33 \quad c_v = \frac{c}{1,33} = \dots$$

$$\left(\frac{c}{c_1}\right) \sin \alpha_1 = \left(\frac{c}{c_2}\right) \sin \alpha_2$$

$n_1 \qquad n_2$

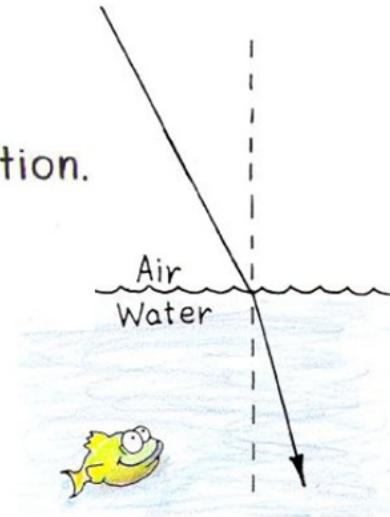
$$n_1 \sin \alpha_1 = n_2 \sin \alpha_2$$

Samsnakk:

NEXT-TIME QUESTION

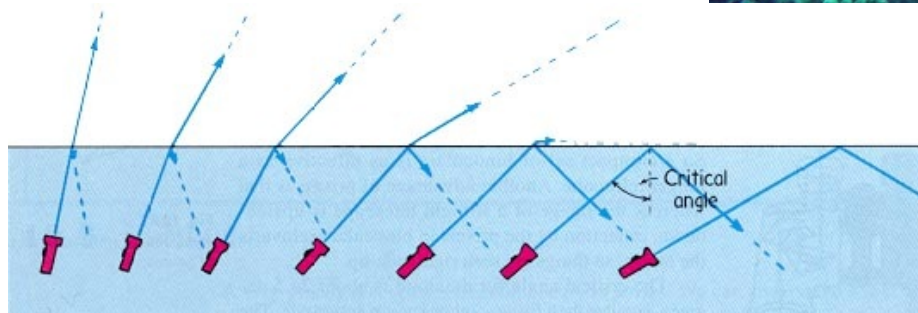
Light rays bend as they pass from air into water at a non-90 degree angle. This is refraction. Which quantity doesn't change when light refracts?

- a) average speed of light.
- b) material's index of refraction.
- c) frequency of light.
- d) wavelength of light.

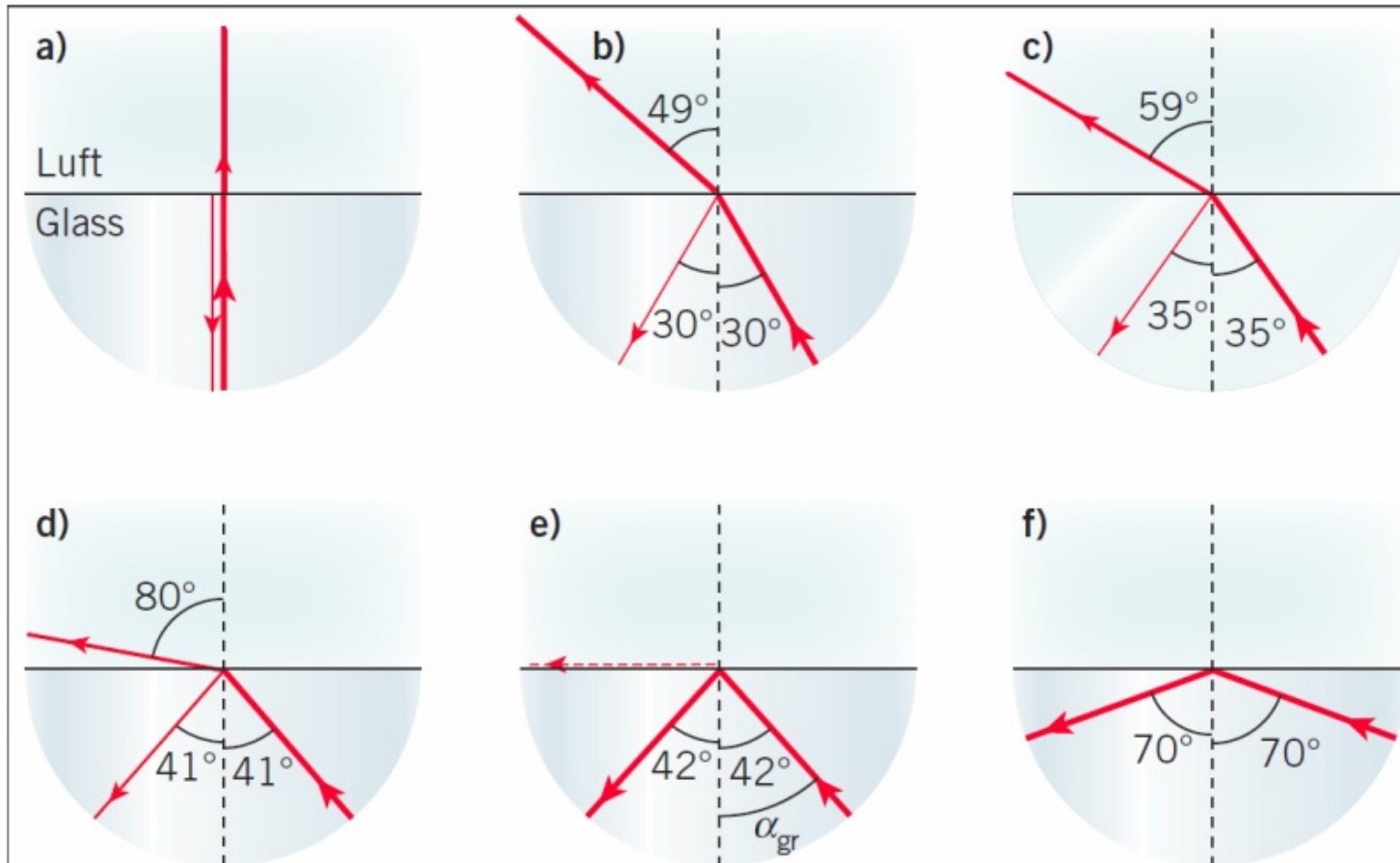


Totalrefleksjon

Når lyset går fra et stoff med stor til et med mindre brytningsindeks kan det totalreflekteres.



Totalrefleksjon



Eksempel

Hva er grensevinkelen for totalrefleksjon ved overgangen glass-luft når glasset har brytningsindeksen 1,50?

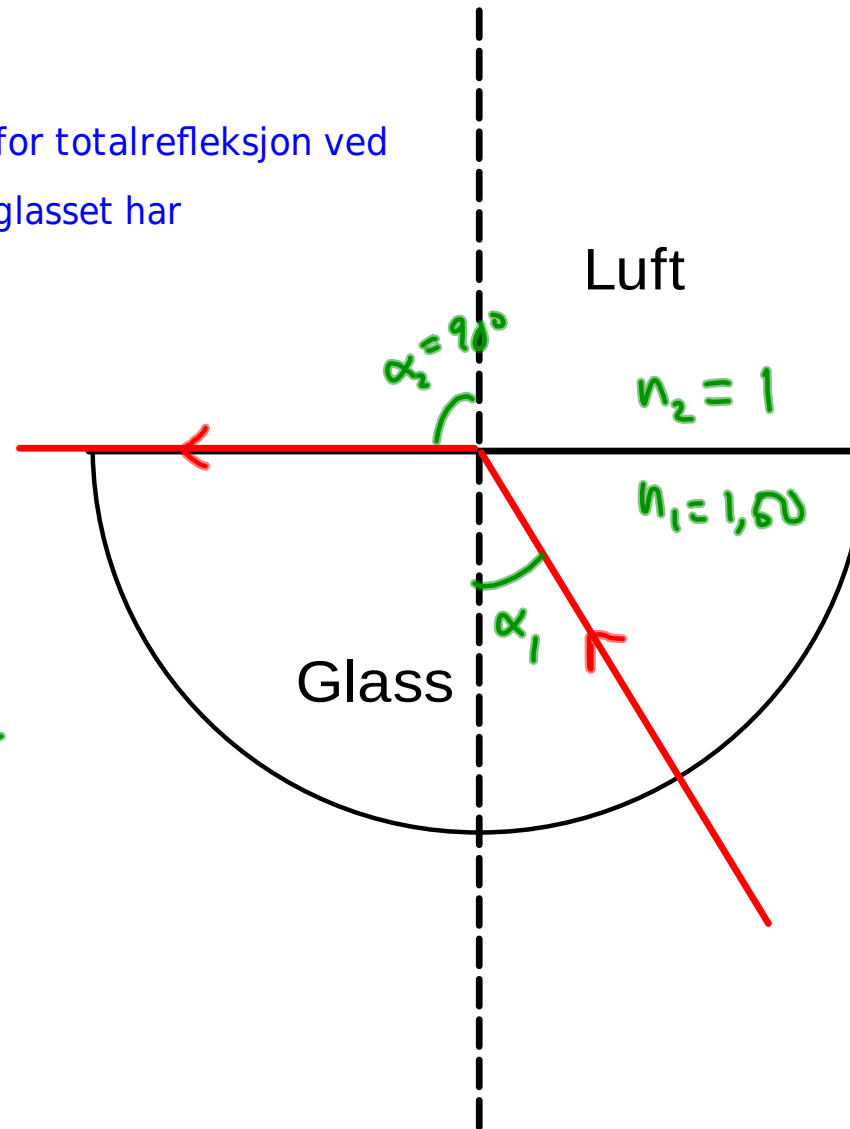
$$n_1 \sin \alpha_1 = n_2 \sin \alpha_2$$

Grensevinkel

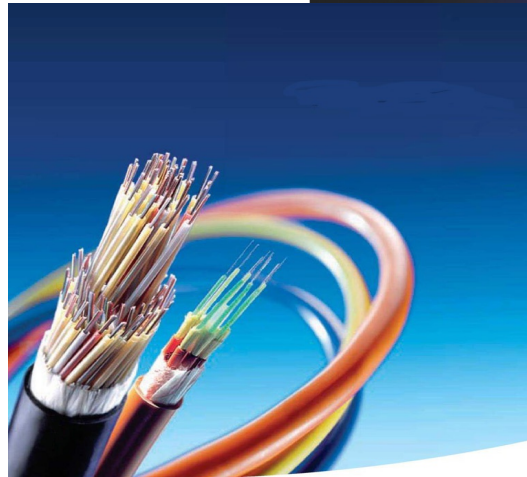
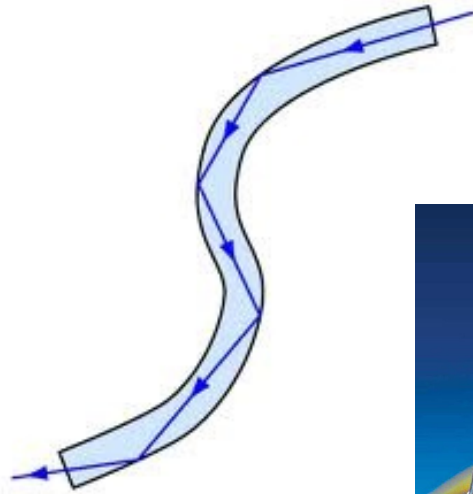
$$n_1 \sin \alpha_{gr} = 1 \cdot \frac{\sin 90^\circ}{1} = 1$$

$$\sin \alpha_{gr} = \frac{1}{n_1} = \frac{1}{1,50} = \dots$$

$$\alpha_{gr} = 48,8^\circ$$



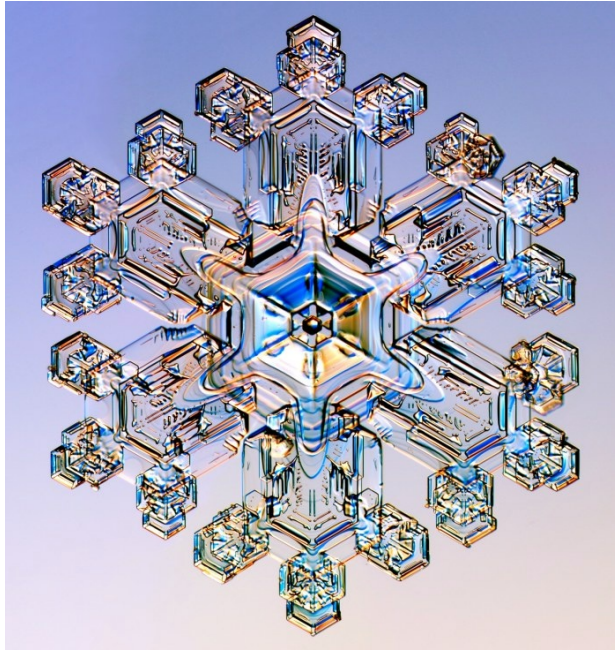
Optisk fiber



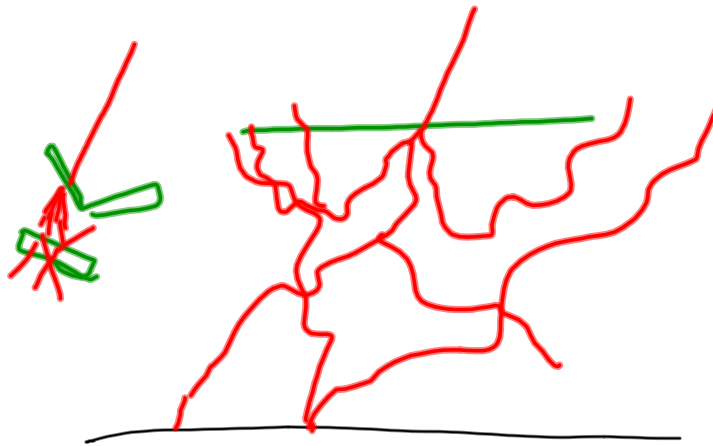
En optisk fiber leder lyset fra ene enden til andre, selv om den ikke er rett. Lyset totalreflekteres mange ganger på veien.

En bunt av optiske fibre kan lede et bilde

Hvorfor er snøen hvit når den består av gjennomsiktige iskrystaller?



<http://www.its.caltech.edu/~atomic/snowcrystals/>





Laserpeker ned i snø

Her er strålen rettet mot
kanten av et ark, så vi ser
hvor stor den egentlig er

