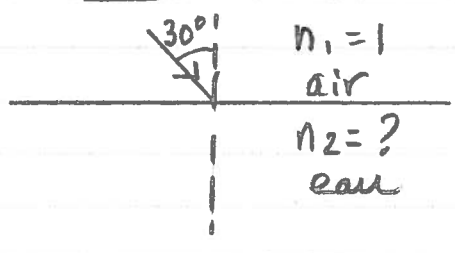


# Corrigé Devoir 6

# 1. a) L'indice absolu veut dire que nous avons le milieu air comme 1er milieu.



$$\theta_1 = 30^\circ$$

$$\theta_2 = 20^\circ$$

$$n_1 = 1$$

$$n_2 = ?$$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$n_2 = \frac{n_1 \sin \theta_1}{\sin \theta_2}$$

$$n_2 = \frac{1 \times \sin 30^\circ}{\sin 20^\circ} = \boxed{1,46}$$

b)

$$n_1 = 1$$

$$\theta_1 = 50^\circ$$

$$n_2 = 1,46$$

$$\theta_2 = ?$$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\sin \theta_2 = \frac{n_1 \sin \theta_1}{n_2}$$

$$\sin \theta_2 = \frac{1 \times \sin 50^\circ}{1,46}$$

$$\theta_2 = \boxed{31,65^\circ}$$

# 2

$$n_1 = 1$$

$$\theta_1 = 45^\circ$$

$$n_2 = 1,50$$

$$\theta_2 = ?$$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\sin \theta_2 = \frac{n_1 \sin \theta_1}{n_2}$$

$$\sin \theta_2 = \frac{1 \times \sin 45^\circ}{1,50}$$

$$\theta_2 = \boxed{28,13^\circ}$$

# 3

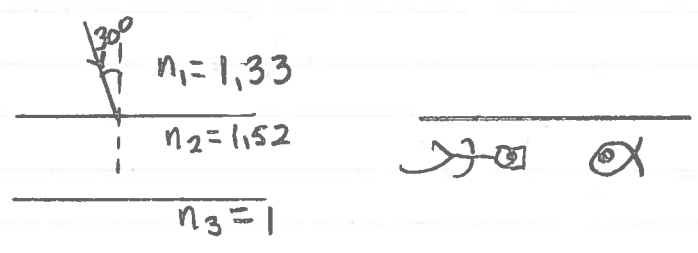
eau-verre

$$n_1 = 1,33$$

$$\theta_1 = 30^\circ$$

$$n_2 = 1,52$$

$$\theta_2 = ?$$



$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\sin \theta_2 = \frac{n_1 \sin \theta_1}{n_2}$$

$$\sin \theta_2 = \frac{1,33 \times \sin 30^\circ}{1,52}$$

$$\theta_2 = \boxed{25,94^\circ}$$

verre-air

$$n_2 = 1,52$$

$$\theta_2 = 25,94^\circ$$

$$n_3 = 1$$

$$\theta_3 = ?$$

$$n_2 \sin \theta_2 = n_3 \sin \theta_3$$

$$\sin \theta_3 = \frac{n_2 \sin \theta_2}{n_3}$$

$$\sin \theta_3 = \frac{1,52 \times \sin 25,94^\circ}{1}$$

$$\theta_3 = \boxed{41,67^\circ}$$

#4

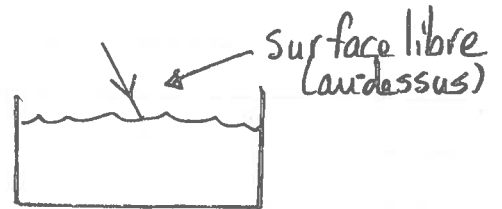
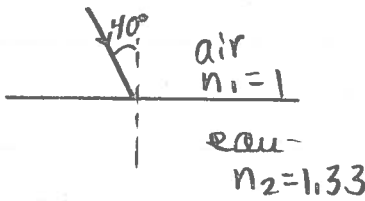
$n_1 = 1$   
 $\theta_1 = 30^\circ$   
 $n_2 = ?$   
 $\theta_2 = 18^\circ$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$n_2 = \frac{n_1 \sin \theta_1}{\sin \theta_2}; n_2 = \frac{1 \times \sin 30^\circ}{\sin 18^\circ}; \boxed{n_2 = 1,62}$$

#5

$n_1 = 1$   
 $\theta_1 = 40^\circ$   
 $n_2 = 1,33$   
 $\theta_2 = ?$



$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\sin \theta_2 = \frac{n_1 \sin \theta_1}{n_2}; \sin \theta_2 = \frac{1 \times \sin 40^\circ}{1,33}; \boxed{\theta_2 = 28,91^\circ}$$

#6

$n_1 = 1$   
 $\theta_1 = 20^\circ$   
 $n_2 = 2,42$   
 $\theta_2 = ?$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\sin \theta_2 = \frac{n_1 \sin \theta_1}{n_2}$$

$$\sin \theta_2 = \frac{1 \times \sin 20^\circ}{2,42}; \boxed{\theta_2 = 8,12^\circ}$$

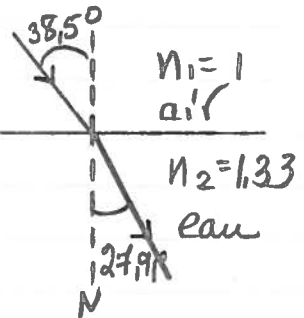
#7

$\theta_1 = 38,5^\circ$   
 $n_1 = 1$   
 $n_2 = 1,33$   
 $\theta_2 = ?$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\sin \theta_2 = \frac{n_1 \sin \theta_1}{n_2}$$

$$\sin \theta_2 = \frac{1 \times \sin 38,5^\circ}{1,33}; \boxed{\theta_2 = 27,91^\circ}$$



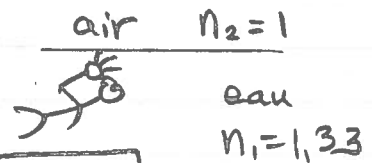
#8

$\theta_1 = 30^\circ$   
 $n_1 = 1,33$   
 $n_2 = 1$   
 $\theta_2 = ?$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\sin \theta_2 = \frac{n_1 \sin \theta_1}{n_2}$$

$$\sin \theta_2 = \frac{1,33 \times \sin 30^\circ}{1}; \boxed{\theta_2 = 41,68^\circ}$$



#9

$n_1 = 1$   
 $\theta_1 = 50^\circ$   
 $n_2 = 1,31$   
 $\theta_2 = ?$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\sin \theta_2 = \frac{n_1 \sin \theta_1}{n_2}$$

$$\sin \theta_2 = \frac{1 \times \sin 50^\circ}{1,31}$$

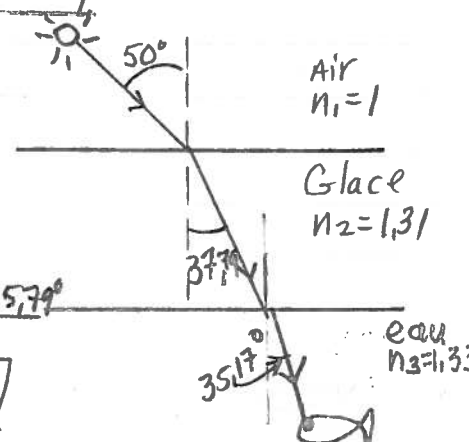
$$\boxed{\theta_2 = 35,79^\circ}$$

$n_2 = 1,31$   
 $\theta_2 = 35,79^\circ$

$n_3 = 1,33$   
 $\theta_3 = ?$

$$\sin \theta_3 = \frac{1,31 \times \sin 35,79^\circ}{1,33}$$

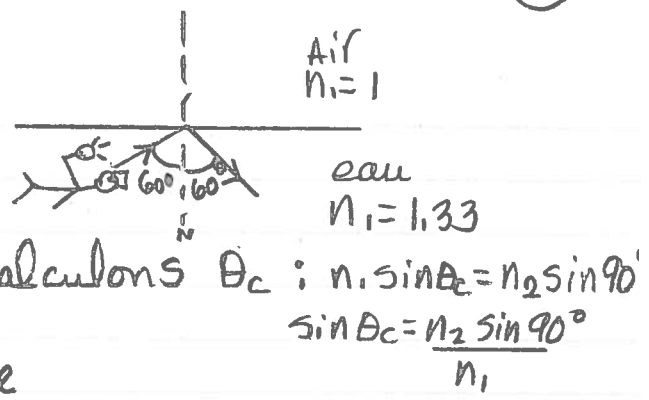
$$\boxed{\theta_3 = 35,17^\circ}$$



#10

$\theta_1 = 60^\circ$   
 $n_1 = 1.33$   
 $n_2 = 1$   
 $\theta_2 = ?$   
 "attention" on a  $n_1 > n_2$   
 donc risque d'angle critique

$n_1 \sin \theta_1 = n_2 \sin \theta_2$   
 $\sin \theta_2 = 1.33 \times \sin 60^\circ$   
 $\theta_2 \rightarrow \text{impossible}$



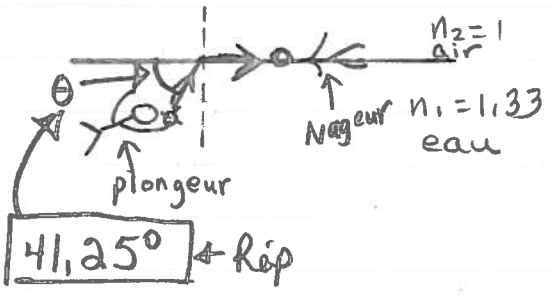
$n_1 \sin \theta_c = n_2 \sin 90^\circ$   
 $\sin \theta_c = \frac{n_2 \sin 90^\circ}{n_1}$

$\sin \theta_c = \frac{1 \times 1}{1.33}; \theta_c = 48.75^\circ$   
 $\theta_1 > 48.75^\circ$  donc réflexion totale interne

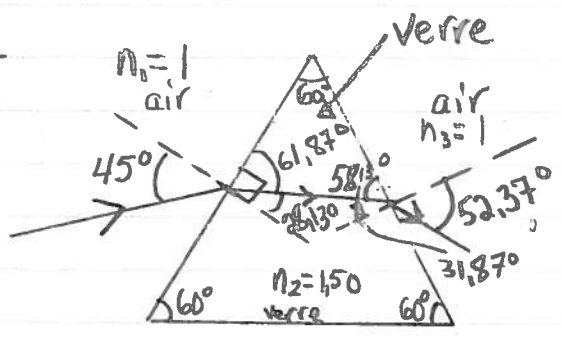
#11

$n_1 = 1.33$   
 $\theta_c = ?$   
 $n_2 = 1$   
 $\theta_2 = 90^\circ$   
 donc par rapport à la surface de l'eau  $90 - 48.75 = 41.25^\circ$  + Rép

$n_1 \sin \theta_c = n_2 \sin 90^\circ$   
 $\theta_c = 48.75^\circ$



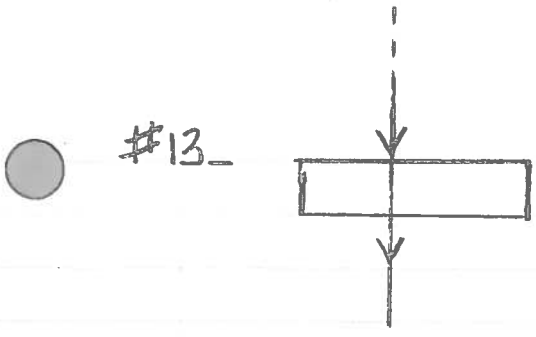
#12



$90 - 28.13 = 61.87^\circ$   
 $180 - 60 - 61.87 = 58.13^\circ$   
 $90 - 58.13 = 31.87^\circ$

air  $\rightarrow$  verre  
 $\theta_1 = 45^\circ$   
 $n_1 = 1$   
 $n_2 = 1.50$   
 $\theta_2 = ?$   
 $n_1 \sin \theta_1 = n_2 \sin \theta_2$   
 $\sin \theta_2 = \frac{n_1 \sin \theta_1}{n_2}$   
 $\sin \theta_2 = \frac{1 \times \sin 45^\circ}{1.50}; \theta_2 = 28.13^\circ$

Verre  $\rightarrow$  air  
 $n_2 = 1.50$   
 $\theta_2 = 31.87^\circ$   
 $n_3 = 1$   
 $\theta_3 = ?$   
 $n_2 \sin \theta_2 = n_3 \sin \theta_3$   
 $\sin \theta_3 = \frac{n_2 \sin \theta_2}{n_3}$   
 $\sin \theta_3 = \frac{1.50 \times \sin 31.87^\circ}{1}; \theta_3 = 52.37^\circ$



#13\_

$$n_1 \sin 0^\circ = n_2 \sin \theta_2$$

$$\sin \theta_2 = \frac{n_1 \sin 0^\circ}{n_2}$$

$$\sin \theta_2 = \frac{n_1 \times 0}{n_2} = 0 ; \boxed{\theta_2 = 0^\circ}$$

il faut tirer que  $n_1 > n_2$

#14\_ a)  $\theta_c = ?$   
 $n_1 = 1.523$   
 $n_2 = 1$   
 $\theta_2 = 90^\circ$   
 b)  $60,84^\circ$   
 c)  $74,84^\circ$

$$n_1 \sin \theta_c = n_2 \sin \theta_2$$

$$\sin \theta_c = \frac{1 \sin 90^\circ}{1,523}$$

$$\theta_c = \boxed{41,04^\circ}$$

#15\_  $n_1 = 1$   
 $\theta_1 = 60^\circ$   
 $n_2 = ?$   
 $\theta_2 = 19,5^\circ$

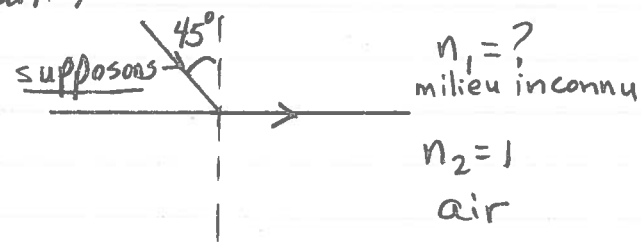
$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$n_2 = \frac{n_1 \sin \theta_1}{\sin \theta_2}$$

$$n_2 = \frac{1 \times \sin 60^\circ}{\sin 19,5^\circ} ; \boxed{n_2 = 2,59}$$

#16\_ Pour trouver l'indice minimal, supposons que l'angle de  $45^\circ$  correspond à l'angle critique. Prenons comme milieu 2, l'air.

$\theta_c = 45^\circ$   
 $n_1 = ?$   
 $n_2 = 1$   
 $\theta_2 = 90^\circ$



$$n_1 \sin \theta_c = n_2 \sin \theta_2$$

$$n_1 = \frac{n_2 \sin \theta_2}{\sin \theta_c} ; n_1 = \frac{1 \times \sin 90^\circ}{\sin 45^\circ} ; \boxed{n_1 = 1,41}$$

Répo l'indice sera supérieur à 1,41

#17\_  $\theta_c = ?$   
 $n_1 = 1,5$   
 $\theta_2 = 90^\circ$   
 $n_2 = 1,33$

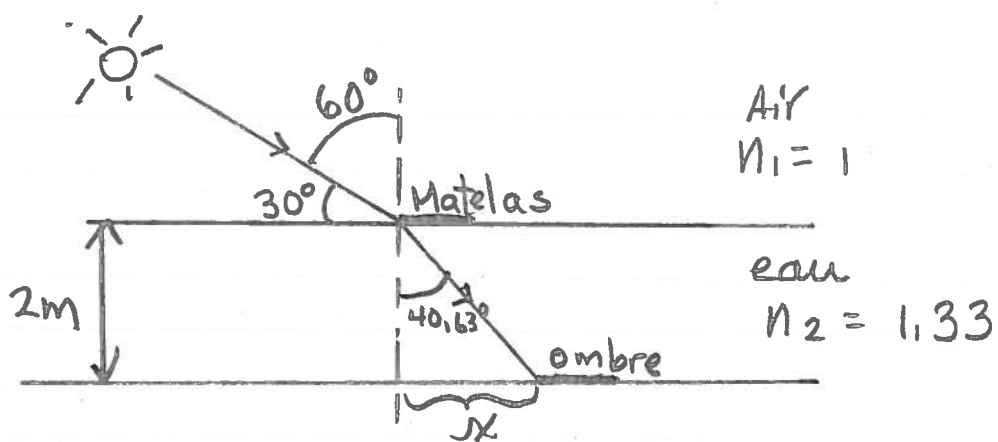
$$n_1 \sin \theta_c = n_2 \sin \theta_2$$

$$\sin \theta_c = \frac{n_2 \sin \theta_2}{n_1}$$

$$\sin \theta_c = \frac{1,33 \times \sin 90^\circ}{1,5} ; \boxed{\theta_c = 62,46^\circ}$$

Répo l'angle maximale sera de  $62,46^\circ$   $\theta_1 < 62,46^\circ$

#18



$$\theta_1: 90^\circ - 30^\circ = 60^\circ$$

$n_1 = 1$ $\theta_1 = 60^\circ$ $n_2 = 1.33$ $\theta_2 = ?$	$n_1 \sin \theta_1 = n_2 \sin \theta_2$ $\sin \theta_2 = \frac{n_1 \sin \theta_1}{n_2}$ $\sin \theta_2 = \frac{1 \times \sin 60^\circ}{1.33}$ <div style="border: 1px solid black; display: inline-block; padding: 2px;"><math>\theta_2 = 40.63^\circ</math></div>
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Trouvons x:

$$\tan 40.63^\circ = \frac{x}{2m} ; x = 2 \tan 40.63^\circ$$

$x = 1.72m$

Rép: L'ombre est décalée de 1.72m par rapport au matelas.