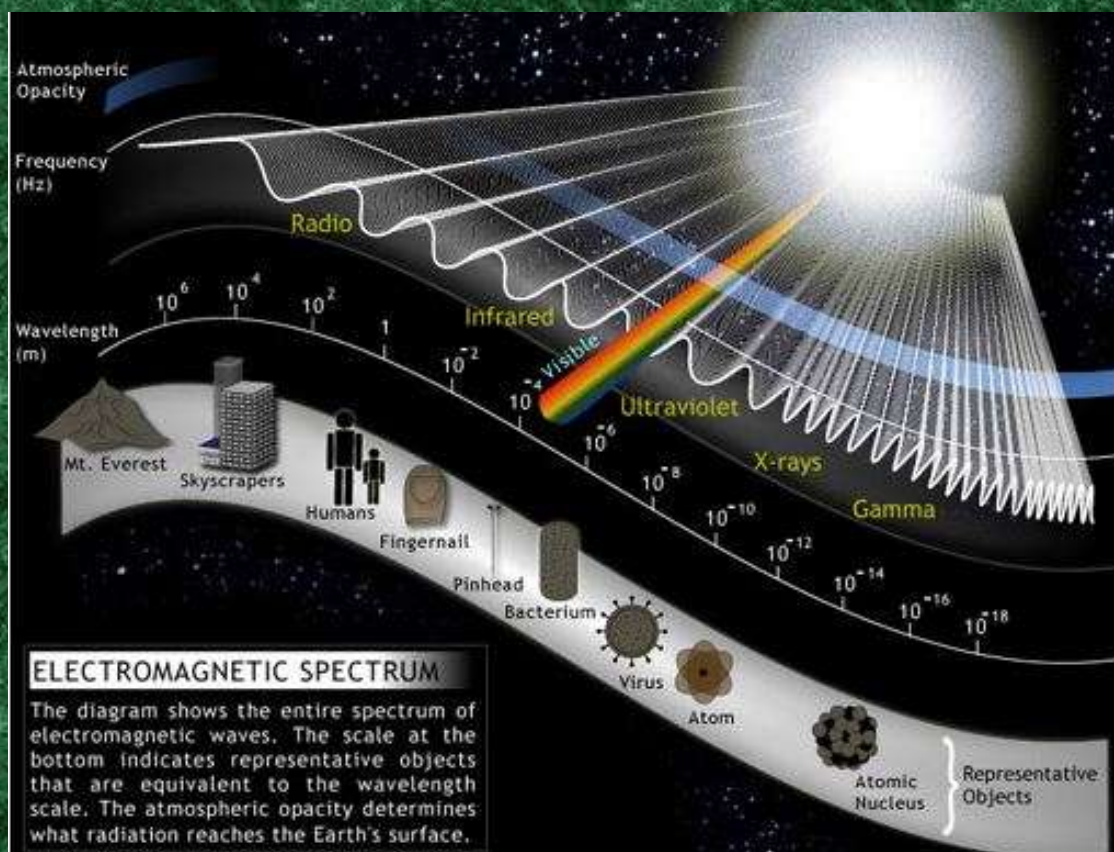


Φυσική Γενικής Παιδείας Β΄ Λυκείου

Τράπεζα Θεμάτων



Μάνος Τραμπούλης

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Η Φύση του Φωτός

Τα Β Θεματα της τράπεζας θεμάτων



μ

2_21730

.1 $\mu_1 = \frac{1}{2} \mu_2$, $\mu_1 = \frac{1}{2} \mu_2$, $\mu_1 = \frac{1}{2} \mu_2$:

$\mu_1 = \frac{1}{2} \mu_2$, $\mu_1 = \frac{1}{2} \mu_2$, $\mu_1 = \frac{1}{2} \mu_2$:

) $\mu_1 = \frac{1}{2} \mu_2$, $\mu_1 = \frac{1}{2} \mu_2$, $\mu_1 = \frac{1}{2} \mu_2$:

$\mu_1 = \frac{1}{2} \mu_2$: $\mu_1 = \frac{1}{2} \mu_2$, $\mu_1 = \frac{1}{2} \mu_2$:

) $\mu_1 = \frac{1}{2} \mu_2$, $\mu_1 = \frac{1}{2} \mu_2$, $\mu_1 = \frac{1}{2} \mu_2$:

4
8

2_21728

.1 $\mu_1 = \frac{10}{9} \mu_2$, $\mu_1 = \frac{10}{9} \mu_2$, $\mu_1 = \frac{10}{9} \mu_2$:

$\mu_1 = \frac{10}{9} \mu_2$, $\mu_1 = \frac{10}{9} \mu_2$, $\mu_1 = \frac{10}{9} \mu_2$:

) $\mu_1 = \frac{10}{9} \mu_2$, $\mu_1 = \frac{10}{9} \mu_2$, $\mu_1 = \frac{10}{9} \mu_2$:

$\mu_1 = \frac{10}{9} \mu_2$: $\mu_1 = \frac{10}{9} \mu_2$, $\mu_1 = \frac{10}{9} \mu_2$:

) $\mu_1 = \frac{10}{9} \mu_2$, $\mu_1 = \frac{10}{9} \mu_2$, $\mu_1 = \frac{10}{9} \mu_2$:

4
8

2_21726

.1 $\mu_1 = \frac{3}{2} \mu_2$, $\mu_1 = \frac{3}{2} \mu_2$, $\mu_1 = \frac{3}{2} \mu_2$:

$\mu_1 = \frac{3}{2} \mu_2$, $\mu_1 = \frac{3}{2} \mu_2$, $\mu_1 = \frac{3}{2} \mu_2$:

) $\mu_1 = \frac{3}{2} \mu_2$, $\mu_1 = \frac{3}{2} \mu_2$, $\mu_1 = \frac{3}{2} \mu_2$:

$\mu_1 = \frac{3}{2} \mu_2$: $\mu_1 = \frac{3}{2} \mu_2$, $\mu_1 = \frac{3}{2} \mu_2$:

) $\mu_1 = \frac{3}{2} \mu_2$, $\mu_1 = \frac{3}{2} \mu_2$, $\mu_1 = \frac{3}{2} \mu_2$:

4
8

2_21724

.1 $\mu = 3,3 \cdot 10^{-19} \text{ J}$

Planck $h = 6,6 \cdot 10^{-34} \text{ J} \cdot \text{s}$,
 $3 \cdot 10^8 \text{ m/s}$.

) μ μ μ μ μ μ μ μ μ μ :

$\cdot 300 \text{ nm}$ $\cdot 600 \text{ nm}$ $\cdot 1200 \text{ nm}$

) 4 8

2_21722

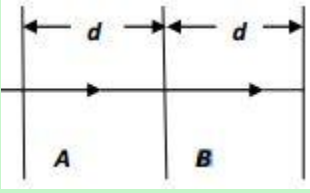
.1 (ZnO) μ
 $n = 2$ μ μ = 300 nm μ
 ZnO μ) $3 \cdot 10^8 \text{ m/s}$ Planck $6,6 \cdot 10^{-34} \text{ J} \cdot \text{s}$,
 $\cdot 3 \cdot 10^{-19} \text{ J}$ $\cdot 3,3 \cdot 10^{-19} \text{ J}$ $\cdot 6,6 \cdot 10^{-19} \text{ J}$ μ :
) 4 8

2_21720

.1 μ $6 \cdot 10^{14} \text{ s}^{-1}$ μ μ
 μ \cdot ($3 \cdot 10^8 \text{ m/s}$)
) μ μ 50% μ μ
 μ :
 μ \cdot μ \cdot 4
) 8

2_21663

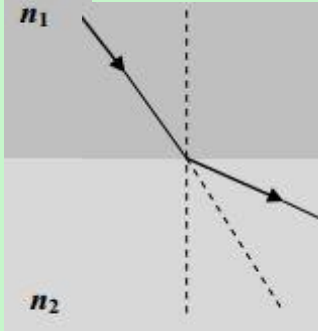
.2 μ μ
 d
 μ , t_1
 t_2 , $\frac{t_1}{t_2} = \frac{3}{2}$
)
 n_2 μ :
 $\cdot 1,8$ $\cdot 1,2$ $\cdot 0,8$ 4
) 9



$n_1 = 1,8$.

2_21657

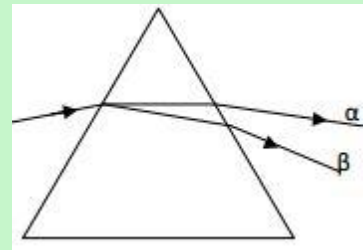
.1 n_1 n_2 ,
 μ .
) μ μ μ
 μ μ
 $\cdot i_1 = i_2$ $\cdot i_1 > i_2$ $\cdot i_1 < i_2$ 4
) 8



2_21655

2 μ
μ μ
οι = 400 nm

μ .
οκ = 700 nm



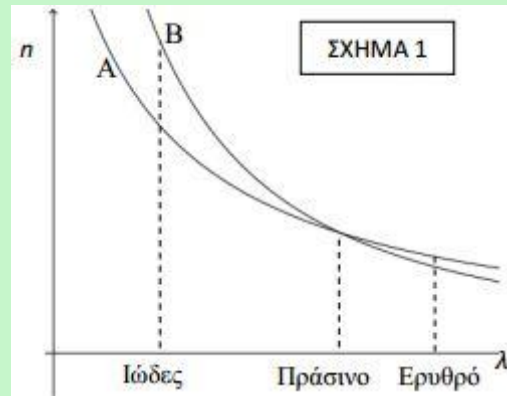
)
· μ
· μ
· μ
)

4
9

2_21653

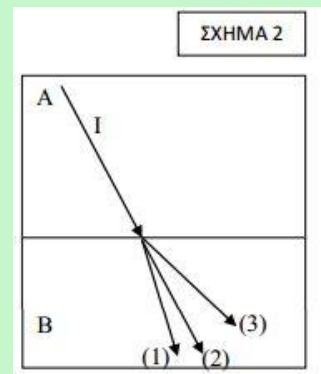
2 μ 1 μ

μ μ μ μ
μ μ μ μ
μ 2, μ μ
μ μ μ μ
) μ μ (μ 1.



ΣΧΗΜΑ 1

)
:
.3,2 1 .1,2 3. .2,3 1.
)



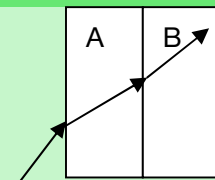
ΣΧΗΜΑ 2

4
9

2_21651

1 μ μ

)
· $n_A > n_B$ · $n_A = n_B$ · $n_A < n_B$
)



4
8

2_21649

1 μ μ

) μ μ 1 μ 2 μ μ $n_1 > n_2$.

(c) $\mu_1 > \mu_2$ ($\lambda_1 > \lambda_2$) ($f_1 > f_2$)

· $c_1 > c_2$, $\lambda_1 > \lambda_2$, $E_1 > E_2$.

· $c_1 < c_2$, $\lambda_1 < \lambda_2$, $E_1 = E_2$

· $c_1 > c_2$, $\lambda_1 > \lambda_2$, $E_1 = E_2$

)

4
8

2_21647

.1 $\mu_1 = 1,5$, $\mu_2 = 1,4$, $\mu_3 = 1,3$ 600 nm
 $\lambda_1 = 400$ nm.

)

· $n = 1,3$

· $n = 1,5$

· $n = 1,4$

)

4
8

2_21643

.1 $\mu_1 = 1,25$, $\mu_2 = 0,8$, $\mu_3 = 1,5$ x_0

)

B) $n = 1,25$ $n = 0,8$ $n = 1,5$ μ

)

4
8

2_21661

.2 $d_1 = 3 \mu$, $d_2 = 2 \mu$, $n = \frac{3}{2}$

)

t_1 t_2

· $\frac{t_1}{t_2} = \frac{3}{2}$ μ

· $\frac{2}{3}$ $\cdot 1$

)

4
9

2_21641

.1 $\mu_1 = 1,5$, $\mu_2 = 1,3$, $\mu_3 = 1,4$ A f_A $f_B = 2f_A$

$\lambda_1 = 400$ nm $\lambda_2 = 700$ nm

A)

)

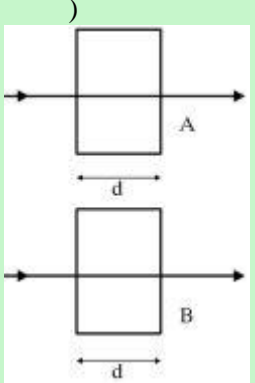
4
8

2_21639

1. μ
 t x. t 50% μ
) μ
 . n = 1,25 . n = 0,8 . n = 1,5 μ : 4
 B) 8

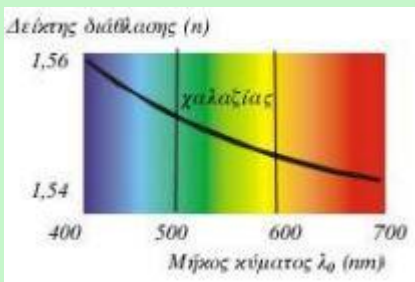
2_21637

1. μ μ ()
 μ μ .
) n_A .
 n_B :
 . n_A = n_B . n_A < n_B . n_A > n_B 4
) 8



2_21635

1. μ
 n () μ
 μ 0 . μ μ
 μ E_A, E_B.
 E_A, E_B :
 E_A > E_B.
) n_A . n_B
 . n_A = n_B . n_A < n_B . n_A > n_B 4
) 8



2_21633

1. μ μ f₁ f₂.
 μ μ 1, 2 . c₁, c₂ μ μ 1, 2
 : c₂ = 2c₁ 2 = 1
 A) E₁ E₂
 . E₁/E₂ = 2 . E₁/E₂ = 1/2 . E₁/E₂ = 1 4
) 8

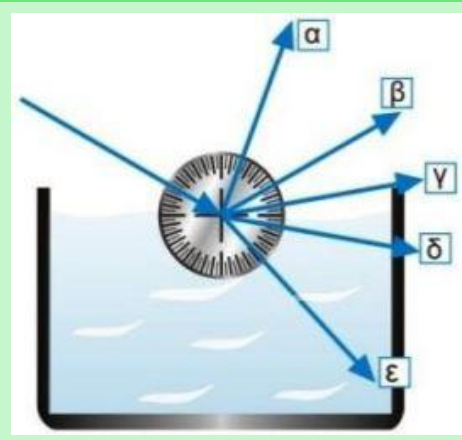
2_21629

.1
 $n_1 = 1,333$; $n_2 = 1,337$; $n_3 = 1,377$
 $c_0 = 3 \cdot 10^8$ m/s.
)
 .
 .
 .
)

4
8

2_21627

.2
)
)
)



2_21625

.1
)
 .
 .
 .
)

4
8

2_21623

.1
 $h = 6,6 \cdot 10^{-34}$ J·s, $c_0 = 3 \cdot 10^8$ m/s, $E = 3,3 \cdot 10^{-19}$ J.
)
 .
 .
 .
)

4
8

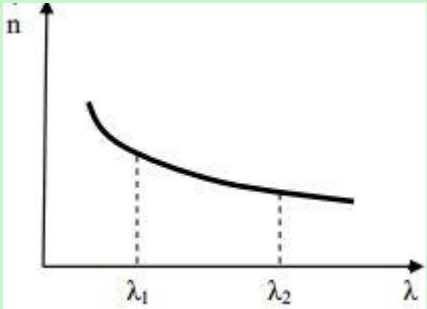
2_21621

.1
 f_E ,
 f_{II} .

.)	$f_E = f_{II}$	$f_E < f_{II}$	$f_E > f_{II}$	4
.)				8

2_21619

1	2	μ	μ	μ	μ	n
		(1)	(2)			
.)				(1)		
.				(2)		
.				μ		
.				4		
.)				9		



2_21617

.2	μ	μ	700nm	400nm.	μ	μ	μ
					$\frac{E_I}{E_E}$		
.)							
.	$\frac{4}{7}$		$\frac{7}{4}$		$\frac{49}{16}$		4
.)							9

2_21615

.2	μ	μ	$n = 5/4$	μ	μ	μ	μ
			$10^{10} \mu$				$\mu \mu$
	$n' = \frac{0}{2}$						
	$n' = 1,5$						
.)							
	μ	μ					
.	$\frac{1}{2} \cdot 10^{10}$		$\cdot 2 \cdot 10^{10}$		$\cdot 2,4 \cdot 10^{10}$		4
.)							9

2_21613

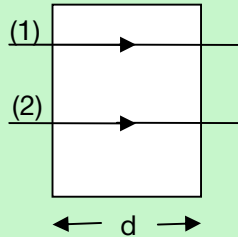
.1	μ	μ	$4 \cdot 10^{18}$	μ	μ	μ	$\mu \mu$
							P.
.)						$\mu \mu$	$' = 2$
	μ						
.	$\cdot 4 \cdot 10^{18}$		$\cdot 2 \cdot 10^{18}$		$\cdot 8 \cdot 10^{18}$		4
.)							8

2_21611

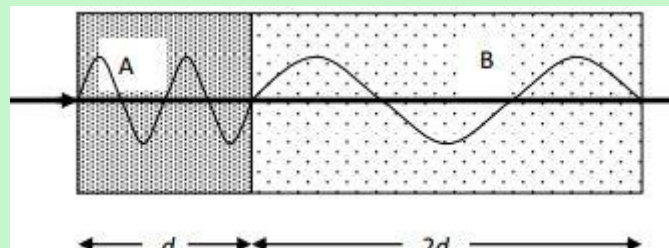
.2 μ μ d d $2t$ t
 μ μ μ μ μ μ
) $n=2$ $n=1$ $n=1,5$: 4
) 9

2_21609

B.1 μ μ d μ μ
 μ μ
) $t_1 = 1,5t_2$:
 $n_1 = n_2$ $n_1 = \frac{3}{2}n_2$ $n_1 = \frac{2}{3}n_2$ 4
) N 8



2_21607

.2 μ μ d $2d$ μ μ μ
 μ μ μ

 1) μ μ ; 2
 1) N 4
 2) μ μ :
 $\frac{t_A}{t_B} = \frac{4}{3}$ $\frac{t_A}{t_B} = \frac{8}{3}$ $\frac{t_A}{t_B} = \frac{3}{4}$ 2
 2) N 5

2_21603

.1 μ μ μ μ μ μ
 μ μ μ μ μ μ
) $n > n_N$ $n = n_N$ $n < n_N$ 4
) 8

2_21605

.1 μ μ μ μ μ μ 0 $1/3$
 μ μ μ μ μ μ

)

$n = \frac{2}{3}$ $n = 3$ $n = 1,33$ 4

)

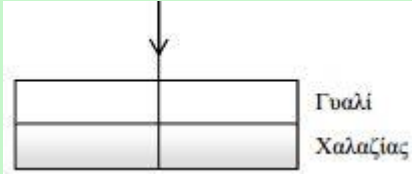
8

2_21510

.2

$n_1 = \frac{3}{2}$

$\frac{n_2}{n_1} = 2$



H

$c_0 = 3 \cdot 10^8 \text{ m/s}$

)

H

$0,5 \cdot 10^8 \text{ m/s}$ 10^8 m/s $2 \cdot 10^8 \text{ m/s}$ 4

)

9

2_21502

B.1

n_B

n_A

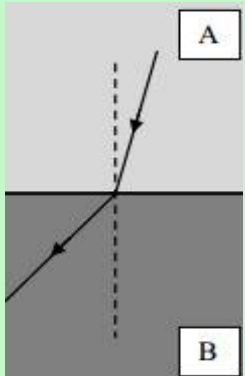
c_A

c_B

$c_A > c_B$ $c_A = c_B$ $c_A < c_B$ 4

)

8



2_21498

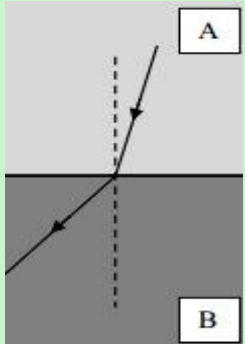
B.1

$n_A = 1,3$

$n = 1,3$ $n = 1,35$ $n = 1,22$ 4

)

8



2_21496

.1

)

2_21476

1. $\mu = 1.5$, $d = 400 \text{ nm}$, $\lambda = 600 \text{ nm}$, $\mu = 1.5$, $d = 700 \text{ nm}$, $\lambda = 400 \text{ nm}$

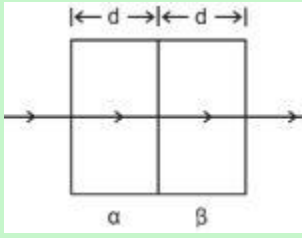
α β

4

8

2_21474

1. $c = 2t$, $f = d \mu$



α β

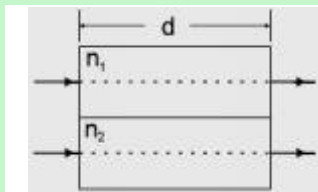
$\frac{n}{n} = 2$, $\frac{n}{n} = \frac{1}{2}$, $\frac{n}{n} = 1$

4

8

2_21472

1. $t_2 = 2t_1$, $n_1 = 2n_2$




$n_1 = 2$, $n_1 = 2$, $n_1 = \frac{2}{2}$

4

8

2_21470

2. $n_1 = 2n_2$, $t_1 = t_2$



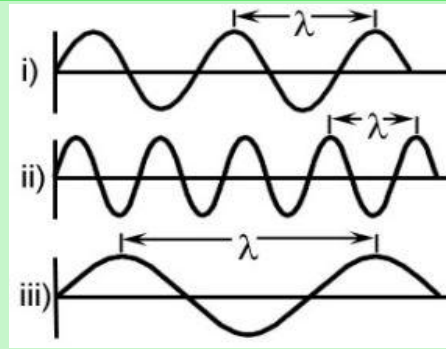
$t_1 = t_2$, $t_1 = 2t_2$, $t_1 = \frac{t_2}{2}$

4

9

2_21468

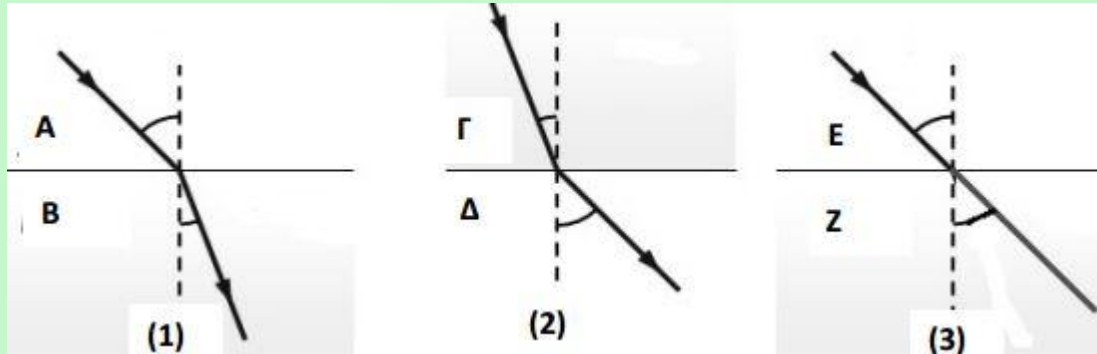
1. μ μ μ μ i, ii, iii, n_i, n_{ii}, n_{iii} .
 μ μ μ μ
)
 n_i, n_{ii}, n_{iii} :
 • $n_i > n_{ii} > n_{iii}$
 • $n_{iii} > n_{ii} > n_i$
 • $n_{ii} > n_i > n_{iii}$
)



8

2_21466

1. (1), (2) (3) μ μ μ
 μ μ n_A, μ $n_B,$
 (2) n μ n, μ
 (3) μ n, μ
 n .



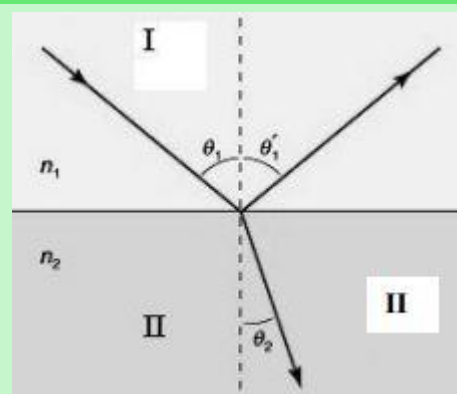
)
 μ μ μ :
 • $n_A < n_B$ • $n < n$ • $n < 1$
)

4

8

2_21464

1. μ μ μ n_1
 μ (μ) μ n_2, μ μ
 (μ) $2.$ μ (μ) 1 μ
)
 μ μ 1 2 :
 • $1 < 2$ • $1 = 2$ • $1 > 2$
)



4

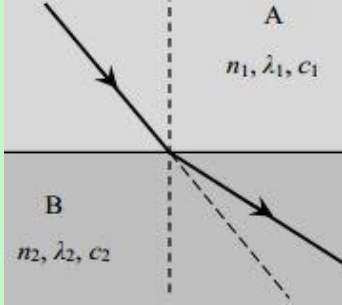
8

2_21462

1. $n_1 = 2,5$ $n_2 = 1,2$ $\mu_1 = 1,5$ $\mu_2 = 1,2$
2. $\mu_1 = 1,5$ $\mu_2 = 1,2$ $n_1 = 2,5$ $n_2 = 1,2$
3. $n_1 = 2,5$ $n_2 = 1,2$ $\mu_1 = 1,5$ $\mu_2 = 1,2$
4. $\mu_1 = 1,5$ $\mu_2 = 1,2$ $n_1 = 2,5$ $n_2 = 1,2$
8

2_21460

1. $n_1 < n_2$ $c_2 > c_1$ $\frac{n_1}{n_2} = \frac{c_2}{c_1}$
4
8



2_21458

1. Planck h $\sqrt{\frac{Ec}{h}}$
4
8

2_21416

1. $n_1 = 2,5$ $n_2 = 2$ $\mu_1 = 1,5$ $\mu_2 = 1,2$
2. $n_1 = 2,5$ $n_2 = 2$ $\mu_1 = 1,5$ $\mu_2 = 1,2$
3. $n_1 = 2,5$ $n_2 = 2$ $\mu_1 = 1,5$ $\mu_2 = 1,2$
4. $\frac{N_1}{N_2} = \frac{5}{4}$ $\frac{N_1}{N_2} = 1$ $\frac{N_1}{N_2} = \frac{4}{5}$
8

2_21410

1) n (RbI)

$n_2 = \frac{11}{10} n_1$

$\frac{c_E}{c_I} = \frac{11}{10}$ $\frac{c_E}{c_I} = \frac{7}{4}$ $\frac{c_E}{c_I} = \frac{10}{11}$

4
8

2_21406

1) $\frac{f_I}{f_E} = \frac{4}{7}$

$\frac{f_I}{f_E} = \frac{4}{7}$ $\frac{f_I}{f_E} = \frac{7}{4}$ $\frac{f_I}{f_E} = 1$

4
8

2_21403

1) $n_1 > n_2$ $n_1 < n_2$ $n_1 < n_2$

4
8

2_21400

2) $n_1 = 3/2$

(1) $n_1 d_1 = n_2 d_2$

4
8

(1) d_1 $(1) \mu$ n_1 $(2) \mu$ $n_2 = 2.$

μ μ d_2 (1) 1 (2) μ μ

μ μ 1 75% $2.$

) d_1 d_2 :

$\cdot \frac{d_1}{d_2} = \frac{1}{2}$ $\cdot \frac{d_1}{d_2} = 1$ $\cdot \frac{d_1}{d_2} = \frac{4}{3}$ 4

) 9

2_21396

.1 μ μ μ μ μ

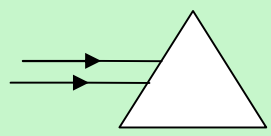
μ μ μ μ μ

) μ :

μ μ μ μ μ μ

) 4

8



2_21390

.1 μ μ f_A

f_B $f_B = 5f_A.$ $c_0.$

) μ μ μ μ μ μ μ μ

μ μ :

$\cdot f_B = \frac{f_A}{5}$ $\cdot f_B = 5 f_A$ $\cdot f_B = f_A$ 4

) 8

2_21386

.1 μ (1) μ μ n_1 μ

) μ $(2),$ n_2 :

$\cdot n_2 = \frac{n_1}{3}$ $\cdot n_2 = \frac{n_1}{9}$ $\cdot n_2 = 3n_1$ 4

) 8

2_21381

.1 μ r_1 $E_1.$ μ μ

) $9r_1.$ μ :

$\cdot 9E_1$ $\cdot 3E_1$ $\cdot E_1/9$ 4

) 8

$\frac{t_1}{t_2} = \frac{5}{4}$ $\frac{t_1}{t_2} = \frac{4}{5}$ $t_1 = t_2$

) 8

2_21335

.2 μ μ d $2d$ d

$2 \cdot 10^6 \mu$ μ $2d$

$1,5 \cdot 10^6 \mu$ μ

$\frac{n_A}{n_B} = \frac{4}{3}$ $\frac{n_A}{n_B} = \frac{8}{3}$ $\frac{n_A}{n_B} = \frac{3}{4}$

) N 9

2_21330

B.2 μ μ 25%

A) μ μ

B) .25% .20% .30%

4

9

2_21324

.1 μ μ μ μ μ 2/3

A) $n = \frac{2}{3}$ $n = \frac{3}{2}$ $n = 1,33$

4

B) 8

2_21320

.1) μ :

O .0,8 .1,2 .1,4

) 4

8

2_21313

.1 () μ ()

) μ μ μ μ ()

() μ μ μ

. > . = . <

) 4

8

2_21307

1. $n_1 < n_2$, $c_1 > c_2$, $\lambda_1 = \lambda_2$.

($\mu_1 > \mu_2$) . $\mu_1 > \mu_2$, $n_1 > n_2$, $c_1 < c_2$.

$n_1 > n_2$, $c_1 > c_2$. $n_1 > n_2$, $c_1 < c_2$.

$n_1 < n_2$, $c_1 > c_2$. $n_1 < n_2$, $c_1 < c_2$.

) 4

) 8

2_21302

1. $\lambda = 10 \text{ nm}$, $f = 3 \cdot 10^{16} \text{ Hz}$, $v = 3 \cdot 10^8 \text{ m/s}$.

($n_1 = 1$, $n_2 = 1,3$) $\mu_1 = 1,5$.

) 4

) 8

2_21294

1. $v_1 = 3 \cdot 10^8 \text{ m/s}$, $v_2 = 2 \cdot 10^8 \text{ m/s}$.

) $\mu_1 = 0,67$, $\mu_2 = 1,5$, $\mu_3 = 0,6$.

) 4

) 8

2_21275

1. $n_1 < n_2$, $c_1 > c_2$.

) $\mu_1 > \mu_2$.

) $\mu_1 > \mu_2$, $n_1 > n_2$, $c_1 < c_2$.

) $n_1 < n_2$, $c_1 > c_2$. $n_1 < n_2$, $c_1 < c_2$.

) 4

) 8