

1 -

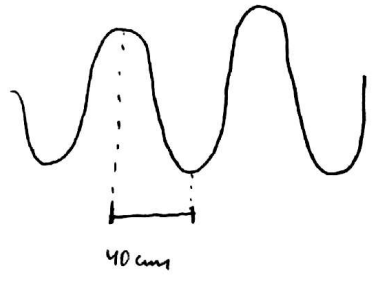
$f = 75 \text{ kHz}$   
 $v = 1,5 \times 10^3 \text{ m/s}$   
 $\lambda = ?$

$v = \lambda \cdot f$   
 $1,5 \times 10^3 = \lambda \cdot 75 \times 10^3$   
 $\frac{1,5 \times 10^3}{75 \times 10^3} = \lambda$

$\lambda = 0,02 \times 10^0 \text{ m}$  ou  $\lambda = 0,02 \text{ m}$

3 -

$f = 440 \text{ Hz}$   
 $\lambda = 0,80 \text{ m}$   
 $v = ?$



$v = \lambda \cdot f$   
 $v = 0,80 \cdot 440$   
 $v = 352 \text{ m/s}$

2 -

$f = ?$   
 $v = 10 \text{ m/s}$   
 $\lambda = 2,0 \text{ m}$

$v = \lambda \cdot f$   
 $10 = 2,0 \cdot f$   
 $f = \frac{10}{2,0} \Rightarrow \underline{f = 5,0 \text{ Hz}}$

4 -

$\lambda = 2,0 \times 10^{-9} \text{ m}$   
 $f = 1,5 \times 10^{17} \text{ Hz}$   
 $v = ?$

$v = \lambda \cdot f$   
 $v = 2,0 \times 10^{-9} \cdot 1,5 \times 10^{17}$   
 $v = 3,0 \times 10^8 \text{ m/s}$

5 -

$\lambda = ?$   
 $f = 60 \text{ Hz}$   
 $v = 3,0 \text{ m/s}$

$v = \lambda \cdot f$   
 $3,0 = \lambda \cdot 60$   
 $\frac{3,0}{60} = \lambda \Rightarrow \underline{\lambda = 0,05 \text{ m}}$

6-

$$v = ?$$

$$\lambda = 210 \times 10^{-9} \text{ m}$$

$$f = 1.5 \times 10^7 \text{ Hz}$$

$$v = \lambda \cdot f$$

$$v = 210 \times 10^{-9} \cdot 1.5 \times 10^7$$

$$\underline{v = 3.15 \times 10^8 \text{ m/s}}$$

7-

$$f = 20 \text{ Hz}$$

$$v = 340 \text{ m/s}$$

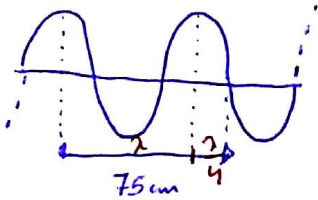
$$\lambda = ?$$

$$v = \lambda \cdot f$$

$$340 = \lambda \cdot 20$$

$$\frac{340}{20} = \lambda \Rightarrow \underline{\lambda = 17 \text{ m}}$$

8-



$$\lambda + \frac{\lambda}{4} = 75$$

$$\frac{4\lambda + \lambda}{4} = 75$$

$$\frac{5\lambda}{4} = 75$$

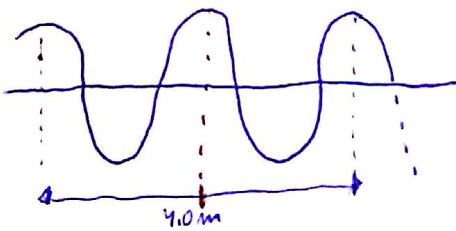
$$75 \cdot 4 = 5 \cdot \lambda$$

$$300 = 5 \cdot \lambda$$

$$\frac{300}{5} = \lambda$$

$$\underline{\lambda = 60 \text{ cm}}$$

9-



a)  $f = 210 \text{ Hz}$

$$\lambda = ?$$

$$\lambda + \lambda = 4.0$$

$$2\lambda = 4.0$$

$$\lambda = \frac{4.0}{2}$$

$$\underline{\lambda = 2.0 \text{ m}}$$

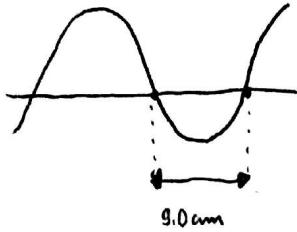
b)  $f = 210 \text{ Hz}$

$$v = \lambda \cdot f$$

$$v = 2.0 \cdot 210$$

$$\underline{v = 4.2 \text{ m/s}}$$

10 -



$$f = 30 \text{ Hz}$$

$$v = ?$$

$$v = \lambda \cdot f$$

$$v = 0,18 \cdot 30$$

$$\lambda = 9,0 \text{ cm} + 9,0 \text{ cm}$$

$$\lambda = 18 \text{ cm}$$

$$\boxed{v = 5,4 \text{ m/s}}$$

11 -

$$a) P = \frac{E}{\Delta t} \Rightarrow 3,0 \times 10^{-3} = \frac{E}{900} \Rightarrow \boxed{E = 2700 \times 10^{-3} \text{ J, ou } E = 2,7 \text{ J}}$$

$$b) I = \frac{P}{A} \Rightarrow I = \frac{3,0 \times 10^{-3}}{4,0 \times 10^{-4}} \Rightarrow \boxed{I = 0,75 \times 10^7 \text{ W/m}^2}$$

12 -

$$L = 0,50 \text{ m}$$

$$v = 75 \text{ m/s}$$

$$a) f_n = n \cdot \frac{v}{2 \cdot L}$$

$$f_1 = 1,0 \cdot \frac{75}{2 \cdot 0,50}$$

$$\boxed{f_1 = 75 \text{ Hz}}$$

$$b) v = \lambda \cdot f$$

$$300 = \lambda \cdot 75$$

$$\frac{300}{75} = \lambda$$

$$\boxed{\lambda = 4,0 \text{ m}}$$

13 -

$$L = 20 \text{ cm}$$

$$v = 50 \text{ m/s}$$

$$a) f_n = n \cdot \frac{v}{2 \cdot L}$$

$$f_1 = 1,0 \cdot \frac{50}{2 \cdot 0,2}$$

$$f_1 = \frac{50}{0,4}$$

$$\boxed{f_1 = 125 \text{ Hz}}$$

$$b) v = \lambda \cdot f$$

$$340 = \lambda \cdot 125$$

$$\lambda = \frac{340}{125}$$

$$\boxed{\lambda = 2,72 \text{ m}}$$

14-

$$T = 5000 \text{ N}$$

$$M = 2.0 \text{ kg/m}$$

$$L = 0.25 \text{ m}$$

a)  $v = ?$

$$v = \sqrt{\frac{T}{\mu}}$$

$$v = \sqrt{\frac{5000}{2.0}}$$

$$v = \sqrt{2500}$$

$$\boxed{v = 50 \text{ m/s}}$$

b)  $f = ?$

$$f = \frac{50}{2 \cdot 0.25}$$

$$\boxed{f = 100 \text{ Hz}}$$

c)  $\lambda = ?$

$$300 = \lambda \cdot 100$$

$$\lambda = \frac{300}{100}$$

$$\boxed{\lambda = 3.0 \text{ m}}$$

15-

$$v_0 = 0$$

$$v_F = 20 \text{ m/s}$$

$$f = 900 \text{ Hz}$$

$$v = 320 \text{ m/s}$$

$$f' = ?$$

$$f' = f \cdot \frac{v \pm v_0}{v \pm v_F}$$

$$f' = 900 \cdot \frac{320}{320 - 20}$$

$$f' = 900 \cdot \frac{320}{300}$$

$$f' = 900 \cdot 1.06$$

$$\boxed{f' = 960 \text{ Hz}}$$

16-

$$L = 50 \text{ cm}$$

$$f_1 = 500 \text{ Hz}$$

a)  $f_s = \frac{v}{2 \cdot L}$

$$500 = \frac{v}{2 \cdot 0.5}$$

$$\boxed{v = 500 \text{ m/s}}$$

b)  $f_s = \frac{v}{2 \cdot L}$

$$f_s = \frac{500}{2 \cdot 0.25}$$

$$\boxed{f_s = 1000 \text{ Hz}}$$

17-

$$L = 15 \text{ cm}$$

$$v = 30 \text{ m/s}$$

$$f = ?$$

$$f_s = \frac{v}{2 \cdot L}$$

$$f_1 = \frac{30}{2 \cdot 0.15}$$

$$f_1 = \frac{30}{0.3}$$

=>

$$\boxed{f_1 = 100 \text{ Hz}}$$