

# STANDING WAVES

①  $\lambda_1 = 12 \text{ m}$   
 $\lambda_2 = 6 \text{ m}$   
 $\lambda_3 = \cancel{4} \text{ m}$   
 $\lambda_4 = \cancel{3} \text{ m}$

NODES  
ON  
ENDS

②  $\lambda_1 = 16 \text{ m}$   
 $\lambda_2 = 8 \text{ m}$   
 $\lambda_3 = \cancel{5.33} \text{ m}$   
 $\lambda_4 = \cancel{4} \text{ m}$

ANTI-NODE  
ON  
ENDS

③  $\lambda_1 = 40 \text{ m}$   
 $\lambda_3 = 13.3 \text{ m}$   
 $\lambda_5 = 8 \text{ m}$   
 $\lambda_7 = 5.71 \text{ m}$

NODE ON  
CLOSED,  
ANTI-NODE ON  
OPEN

④  $\lambda_1 = 8 \text{ m}$   
 $\lambda_2 = 4 \text{ m}$   
 $\lambda_3 = 2.67 \text{ m}$   
 $\lambda_4 = 2 \text{ m}$

⑤  $\lambda_1 = 6 \text{ m}$   
 $\lambda_2 = 3 \text{ m}$   
 $\lambda_3 = 2 \text{ m}$   
 $\lambda_4 = 1.5 \text{ m}$

⑥  $v_{\text{sound}} = 331 \text{ m/s} + (-.59)(20^\circ\text{C}) = 342.8 \text{ m/s}$

$$f = \frac{v}{\lambda}$$

$$f_1 = 57.13 \text{ Hz}$$

$$f_2 = 114.27 \text{ Hz}$$

$$f_3 = 171.4 \text{ Hz}$$

$$f_4 = 228.53 \text{ Hz}$$

⑦  $\lambda = \frac{4L}{n}$

$$\lambda_1 = 48 \text{ m}$$

$$\lambda_3 = 16 \text{ m}$$

$$\lambda_5 = 9.6 \text{ m}$$

$$\lambda_7 = 6.86 \text{ m}$$

⑧  $v_{\text{sound}} = 342.8 \text{ m/s}$

$$f = \frac{v}{\lambda}$$

$$f_1 = 7.14 \text{ Hz}$$

$$f_3 = 21.43 \text{ Hz}$$

$$f_5 = 35.7 \text{ Hz}$$

$$f_7 = 50 \text{ Hz}$$

⑨  $L = 32 \text{ cm} = .32 \text{ m}$

$$\lambda = \frac{2L}{n} = .64 \text{ m}$$

$$v = \lambda f$$

$$v = (.64 \text{ m})(512 \text{ Hz})$$

$$v = 327.68 \text{ m/s}$$

⑩  $L = 20 \text{ cm} = .2 \text{ m}$

$$\lambda = \frac{4L}{n} = .8 \text{ m}$$

$$v = \lambda f$$

$$v = (.8 \text{ m})(427 \text{ Hz})$$

$$v = 341.6 \text{ m/s}$$