VENTILATOR CALCULATIONS

1. Given an inspiratory time of 1 2 seconds and an expiratory time of 3 seconds, calculate the I:E ratio and the respiratory rate.

$$TCT = T_I + T_E = 3 + 1.2 = 4.2 \text{ sec}$$

$$f = \frac{60}{TCT} = \frac{60}{4.2} = 14.29 \approx 14$$

$$\frac{T_E}{T_I} = \frac{3}{1.2} (\textit{bigger on top}) = 2.5, I : E = 1 : 2.5$$

2. Given an inspiratory time of 0.8 seconds and an expiratory time if 1.5, calculate the I:E ratio and the rate.

$$\frac{T_E}{T_I} = \frac{1.5}{.8} = 1.875, I : E = 1 : 1.9$$

$$TCT = T_I + T_E = 0.8 + 1.5 = 2.3 \text{ sec}$$

$$\mathrm{f} = \frac{60}{\mathrm{TCT}} = \frac{60}{2.3} = 26.08 \approx 26$$

3. Given an expiratory time of 1.75 seconds and an inspiratory time of 1 second, calculate the I:E ratio and the rate.

$$\frac{\mathrm{T_E}}{\mathrm{T_I}} = \frac{1.75}{1} = 1.75, \mathrm{I : E} = 1 : 1.8$$

$$\mathrm{TCT} = 1.8 + 1 = 2.8$$

$$\mathrm{f} = \frac{60}{\mathrm{TCT}} = \frac{60}{2.75} = 21.8 \approx 22$$

4. Given a f of 40/min and an I:E ratio of 1:2, calculate the inspiratory and expiratory time.

$$TCT = \frac{60}{f} = \frac{60}{40} = 1.5 \text{ sec}$$

$$\mathrm{T_I} = \frac{TCT}{I + E} = \frac{1.5}{1 + 2} = \frac{1.5}{3} = 0.5 \text{ sec}$$

$$\mathrm{T_E} = \mathrm{TCT - T_I} = 1.5 - 0.5 = 1.0 \text{ sec}$$

5. A newborn is being ventilated on a time-cycled, pressure limited ventilator. The ventilatory parameters are as follows:
Rate: 40/min
Peak Pressure 32 cm H_2O
PEEP 5 cm H_2O
Inspiratory Time 0.4 seconds

What is the I:E ratio?

$$TCT = \frac{60}{40} = 1.5 \text{ sec}$$

$$\mathrm{T_E} = \mathrm{TCT - T_I} = 1.5 - 0.4 = 1.1 \text{ sec}$$

$$\frac{\mathrm{T_E}}{\mathrm{T_I}} = \frac{1.1}{0.4} = 2.75, \mathrm{I : E} = 1 : 2.8$$

6. The respiratory care practitioner receives an order to initiate mechanical ventilation at a rate of 45 and an I:E ratio of 1:2. Which of the following times would achieve the specified ratio?

A. 0.54
B. 0.48
C. 0.44
D. 0.40
E. 0.20

$$\mathrm{TCT} = \frac{60}{\mathrm{f}} = \frac{60}{45} = 1.\overline{3} \text{ sec}$$

$$\mathrm{T_I} = \frac{\mathrm{TCT}}{\mathrm{I + E}} = \frac{1.3}{1 + 2} = \frac{1.3}{3} = 0.4 \text{ sec}$$

7. The doctor orders a f of 50/minute and an I:E ration of 1:1.5. Calculate the Inspiratory and expiratory time.

$$TCT = \frac{60}{f} = \frac{60}{50} = 1.2 \text{ sec}$$

$$T_I = \frac{TCT}{I+E} = \frac{TCT}{1+1.5} = \frac{1.2}{2.5} = 0.48 \approx 0.5 \text{ sec}$$

$$T_E = TCT - T_I = 1.2 - 0.5 = 0.7 \text{ sec}$$

8. The doctor orders a f of 60/min and an I:E ratio of 1:1. Calculate the inspiratory and expiratory time.

$$TCT = \frac{60}{f} = \frac{60}{60} = 1.0 \text{ sec}$$

$$T_I = \frac{TCT}{I+E} = \frac{TCT}{1+1} = \frac{1.0}{2.0} = 0.5 \text{ sec}$$

$$T_E = TCT - T_I = 1.0 - 0.5 = 0.5 \text{ sec}$$

9. The doctor orders a f of 30/min and an I:E ratio of 1:3. Calculate the inspiratory and expiratory time.

$$TCT = \frac{60}{f} = \frac{60}{30} = 2 \text{ sec}$$

$$T_I = \frac{TCT}{I+E} = \frac{TCT}{1+3} = \frac{2}{4} = 0.5 \text{ sec}$$

$$T_E = TCT - T_I = 2 - 0.5 = 1.5 \text{ sec}$$

10. The doctor orders a respiratory rate of 35/min and an inspiratory time of 0.75 seconds. What is the I:E ratio?

$$f = \frac{60}{TCT} = \frac{60}{35} = 1.71 \text{ sec}$$

$$T_E = TCT - T_I = 1.71 - 0.75 = .96 \approx 1 \text{ sec}$$

$$I:E = 0.75:1 = \frac{1}{.75} = 1.33, I:E = 1:1.3$$