1) B

The equation for calculating the mean airway pressure in VCV is: \( 0.5 \times (\text{PIP} - \text{PEEP}) \times (\text{Ti} / \text{Ttot}) \)

PIP: Peak inspiratory pressure, PEEP: positive end expiratory pressure, Ti: inspiratory time, Ttot: total respiratory cycle

2) B

The equation for calculating the mean airway pressure in PCV is: \( \text{Ti} / \text{Ttotal} \times (\text{DP} + \text{PEEP}) \)

3) B

The ventilator does not measure the tidal volume directly, however it integrates it from the flow signal as: Peak inspiratory flow – end inspiratory flow / Inspiratory time. Similarly expiratory tidal volume is peak expiratory flow – end expiratory flow / expiratory time

4) C

The equation for inspiratory flow in PCV is: \( \Delta P / \text{Raw} \times e^{\frac{t}{\tau}} \)

DP is the pressure applied to the airway above PEEP, t is the elapsed time after initiation of the inspiratory phase, and e is the base of the natural logarithm.

Simplified equation is Driving Pressure / Resistance

5) A

6) D

In the example above, the time constant \( \tau \) (Compliance X Resistance) of the respiratory system is 0.5 seconds. Time constant is the time for the flow decay to 37 %. It usually takes 3-4 time constants to reach almost zero flow.

Increasing the inspiratory time from 0.75 seconds to 1 second would increase the tidal volume without increasing the inspiratory pressure. Increasing the I time beyond 1.5-2 seconds would not affect the tidal volume.
7) B
As tidal volume = Flow / Time, the time = tidal volume / Flow
   300 ml / 30 L/min (500 ml/sec)
   300 / 500 = 0.66 seconds

8) B
As in question 4, Increasing the resistance will result in decreasing the inspiratory flow

9) B
Per the equations listed above, and figure below. The mean airway pressure is higher in PCV compared to VCV with same PIP, Tidal volume, Inspiratory time

![Diagram showing Volume/Flow Control and Pressure Control](image)

10) A
The equation of Resistance (cmH2O/L/s) is the difference between PIP and Plateau pressure (using the inspiratory hold maneuver) divided by the inspiratory flow