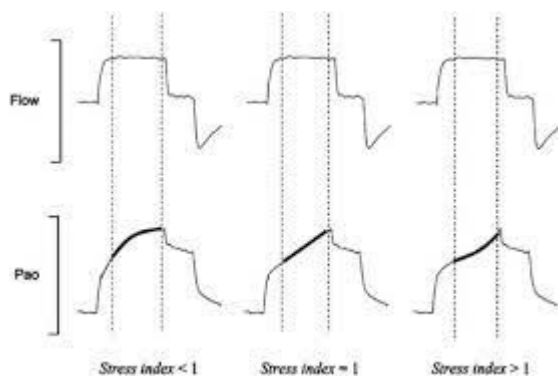




Ventilator Waveforms

1) C, 2) B

Stress index: inspiratory limb of the airway pressure in VCV with constant flow and passive patient (patient can't be having any effort) < 1 (concave upwards) indicate continuous recruitment which might respond to increasing the PEEP, Stress index of 1 (straight line) means adequate PEEP, Stress index > 1 (convex) indicate hyperinflation and may need to reduce PEEP (like in the question).



3) C

The quasi-static P-V curve showing a low inflection point (LIP) and widest hysteresis (difference in volume between inspiratory and expiratory limb) is maximum at 10 cmH₂O and hence PEEP > 10 is adequate.

4) B

The high inflection point (HIP) where the curve looks like a beak with low compliance is about 30 cmH₂O so driving pressure and tidal volume should be set below this point.

5) D

All the answers are correct and cause that sharp rise in the airway pressure and flow and correcting them are important as this can cause discomfort for the patient and can lead to early cycling.

6) B

Kussmaul breathing is deep fast breathing usually happens in acidemia, Cheyne-Stokes breathing is characterized by cyclical episodes of apnea and hyperventilation and usually is secondary to brain lesions or injury or heart failure. The figure does not fit auto trigger given the irregularity of the breaths and the intensity.

7) A

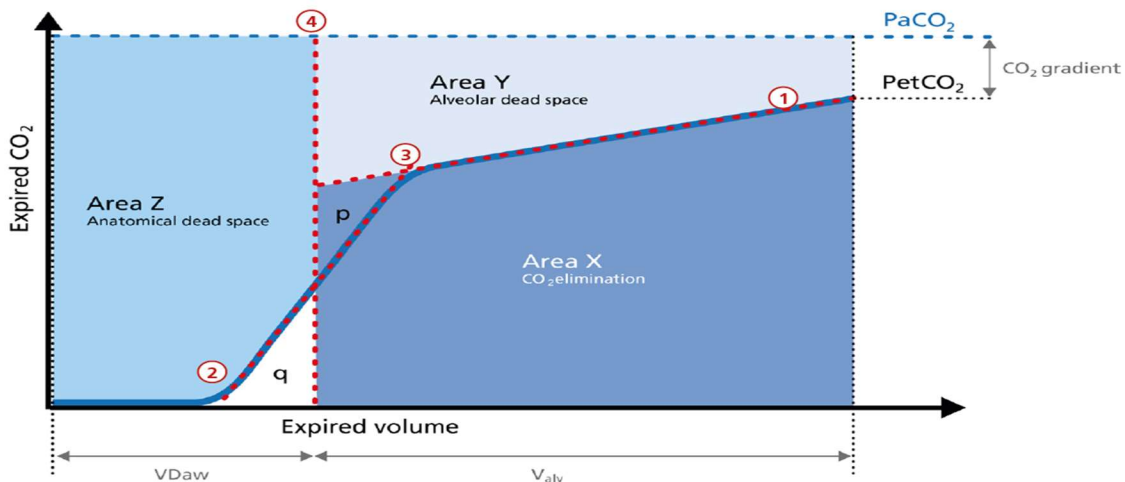
The figure showing the expiratory trans-pulmonary pressure (Alveolar pressure – pleural pressure) is in the negative value indicating the pressure outside the alveoli is higher than what is inside (PEEP) that will lead to alveolar collapse at the end of expiration that can cause atelectrauma and biotrauma from repeated alveolar closing and reopening. Setting the PEEP above zero trans-pulmonary pressure might avoid those consequences.

8) B

The curve showing that the expiratory flow does not reach baseline or zero at the end of the breath indicating auto-PEEP and measures need to be taken to correct it (e.g. bronchodilators, prolonging the expiratory phase of breath, reduce tidal volume, adding external PEEP).

9) B

The volumetric capnography in COPD patients shows a prolonged Phase II, an increase in PetCO₂, and a continuously ascending slope without plateau in Phase III.



1. Slope of Phase III
2. Slope of Phase II
3. The intersection of lines 1 and 2 defines the limit between Phases II and III.
4. A perpendicular line is projected onto the x-axis and its position is adjusted until the areas *p* and *q* on both sides become equal.

10) D

The pleural pressure shows negative deflections (white arrows) with no triggered breath, that can happen in effective effort (weakness, high trigger sensitivity) or during an expiratory pause maneuver.