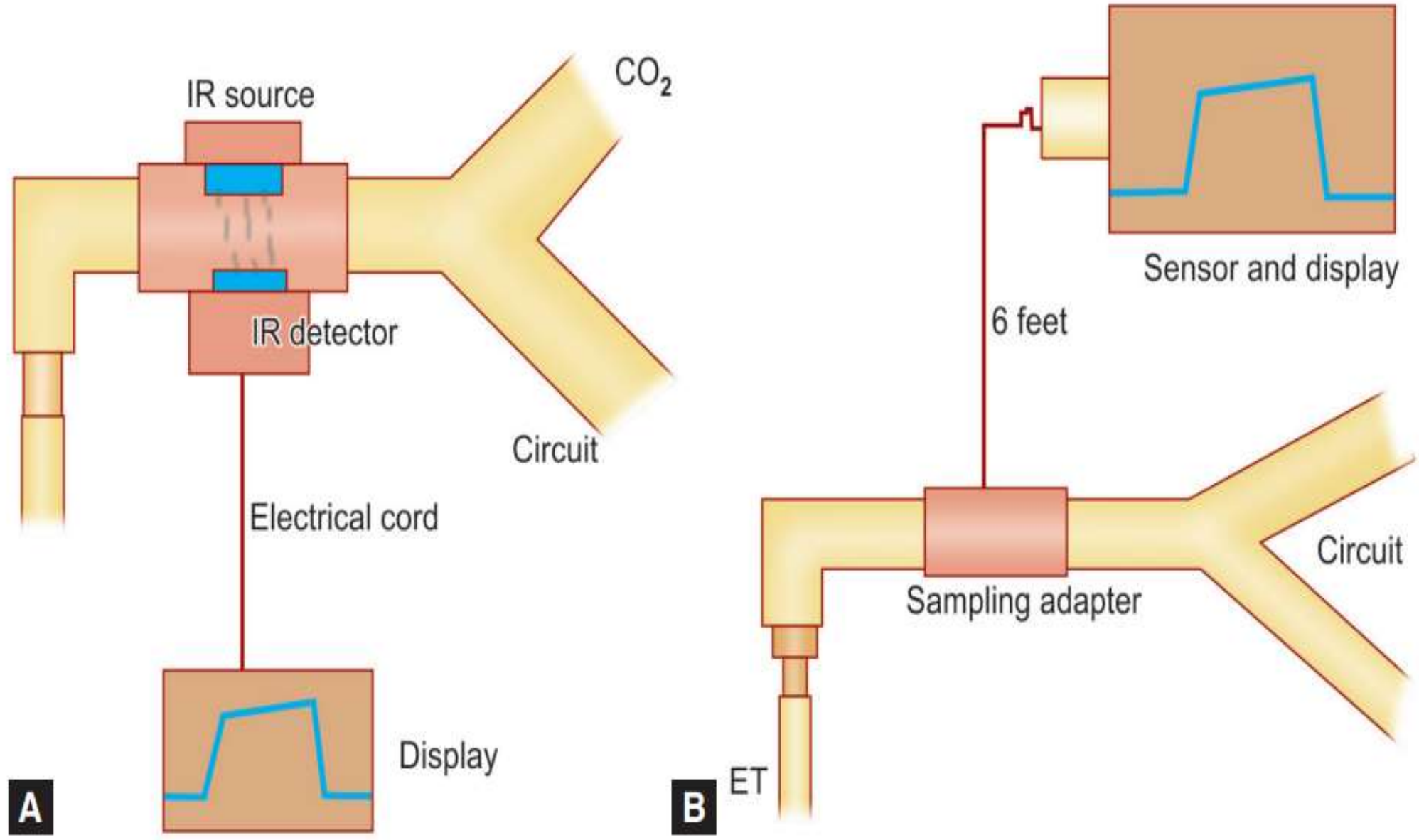
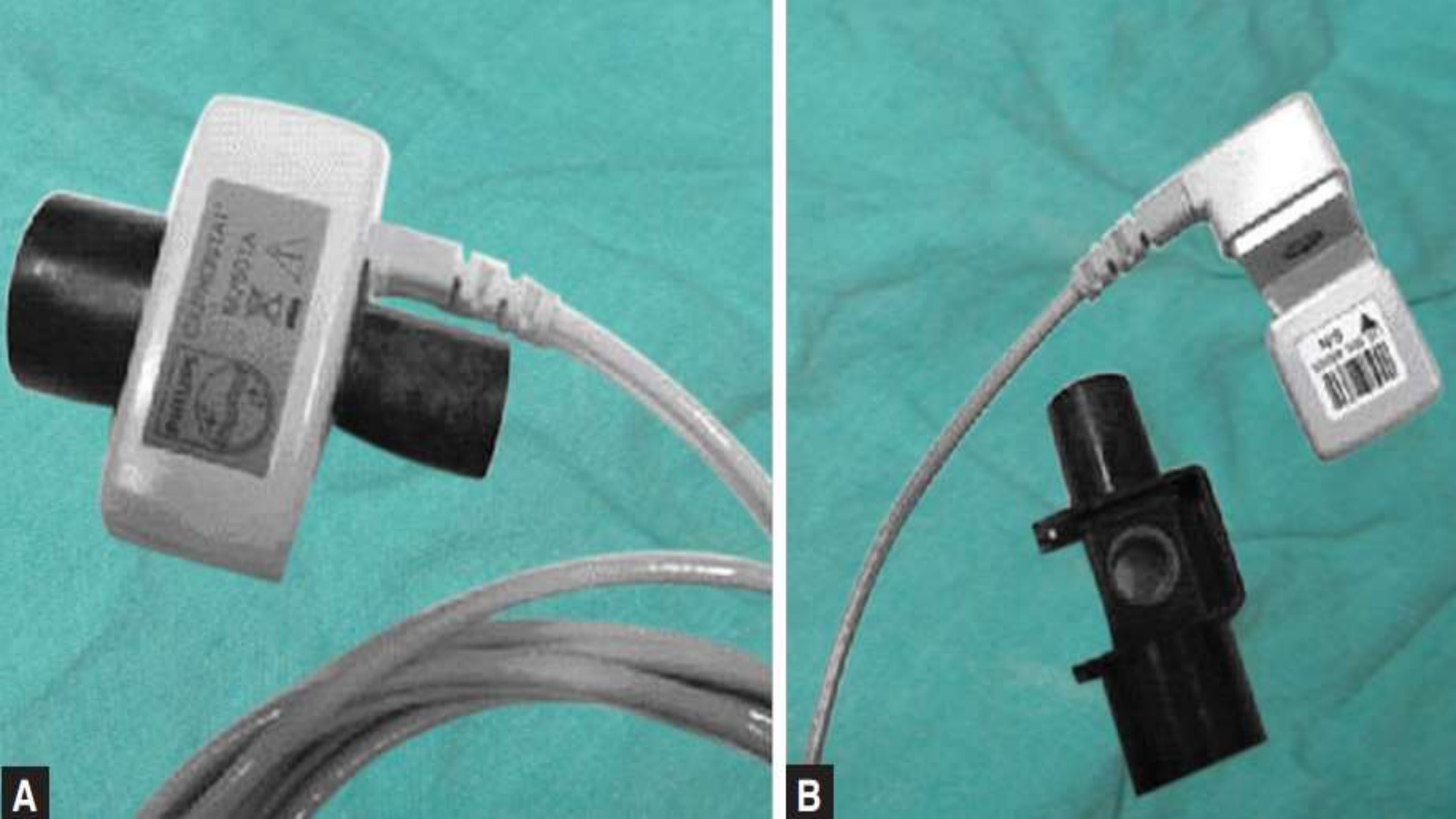
A practical lecture of Capnography



Figs 2A and B Mainstream capnography has a sensor located across the airway. In sidestream capnograph, the respiratory gases are aspirated into the device by a pump via a 6 feet sampling tube into the device


A
B

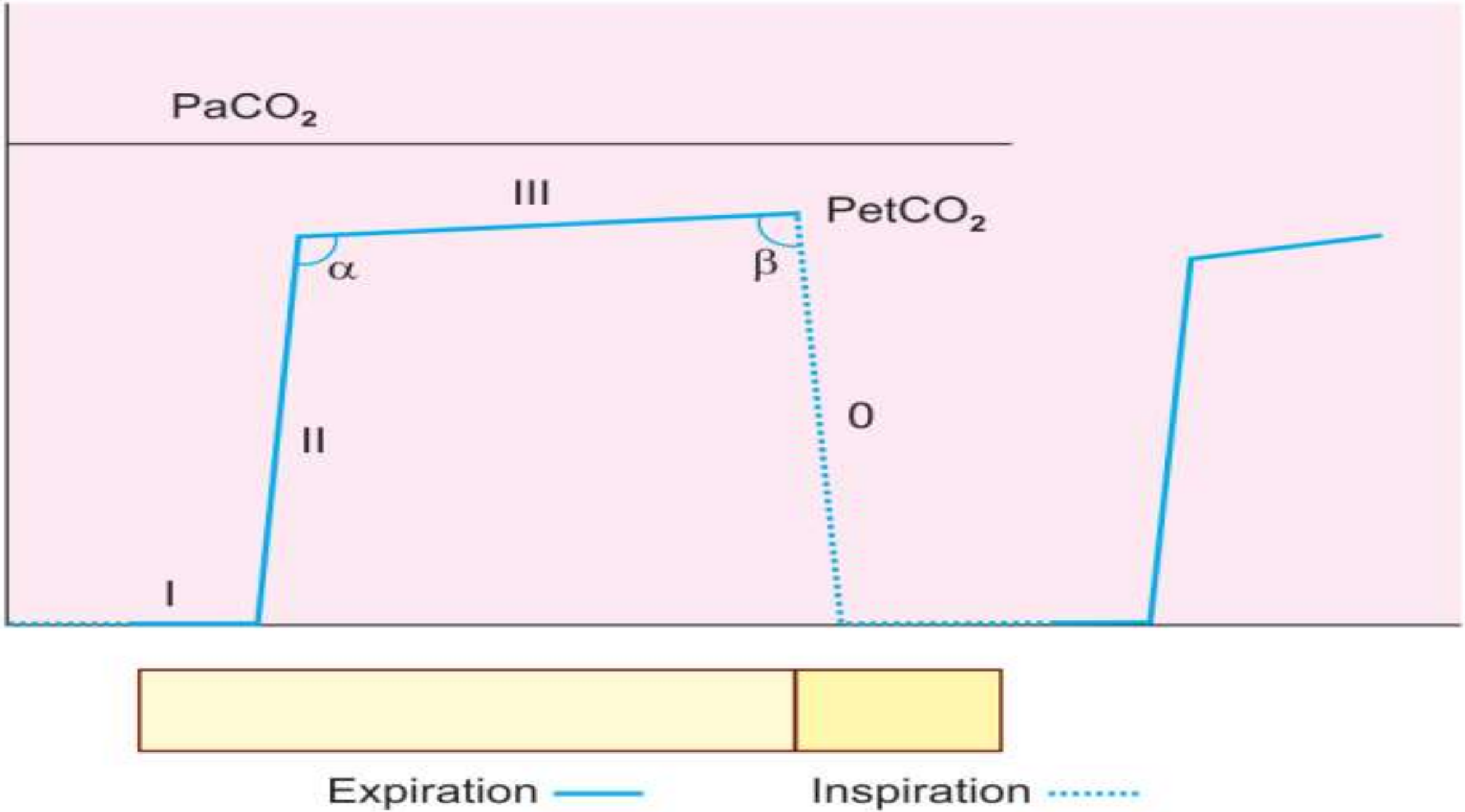
(a)

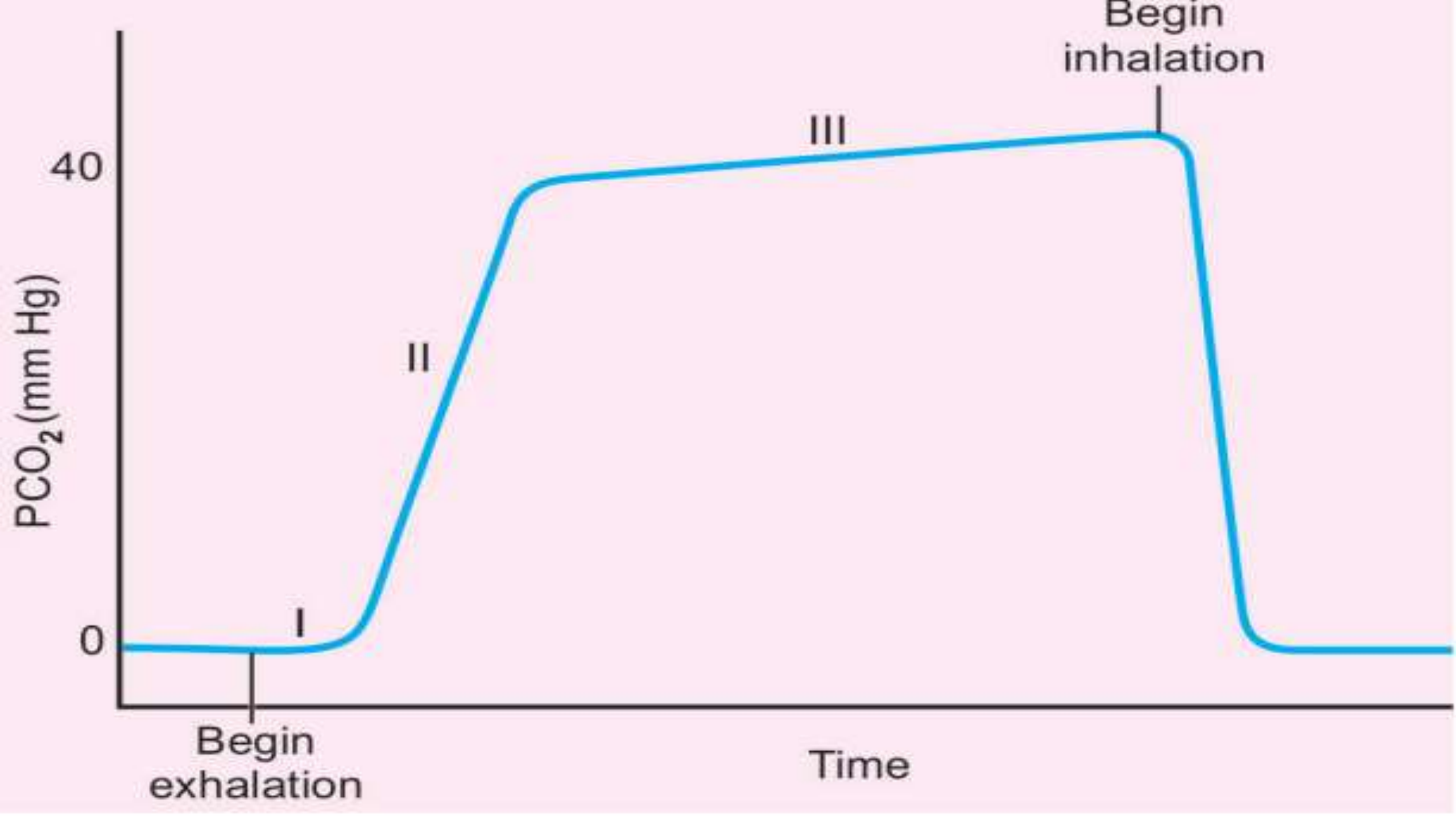
(b)


A


PHILIPS
B

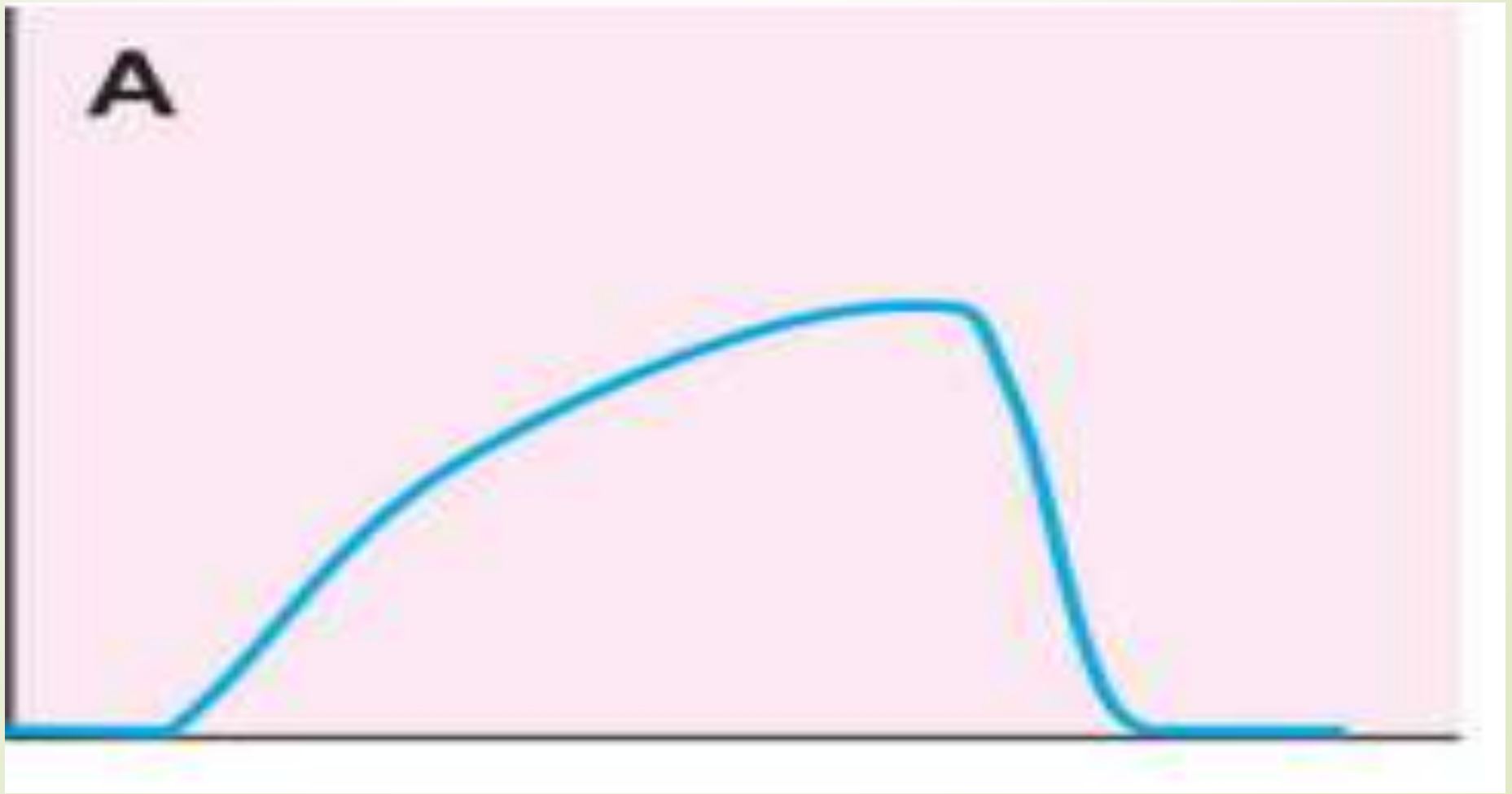
Mainstream	Sidestream
CO_2 sensor is housed external to the breathing circuit	CO_2 sensor is inserted between the breathing circuit and endotracheal tube
No gas removed from circuit	Gas is constantly aspirated from circuit via a 6 feet sampling tube into the unit containing CO_2 sensor
ncrease in mechanical dead space	Minimal dead space
Waveform in real time	Waveform is delayed (1–4 seconds) due to transportation of gases from the patient's airway to the unit containing the sensor


$PaCO_2$
III
$PetCO_2$
α
β
II
0
I
Expiration
Inspiration


Begin
inhalation
III
40
II
PCO_2(mm Hg)
I
0
Begin
exhalation
Time

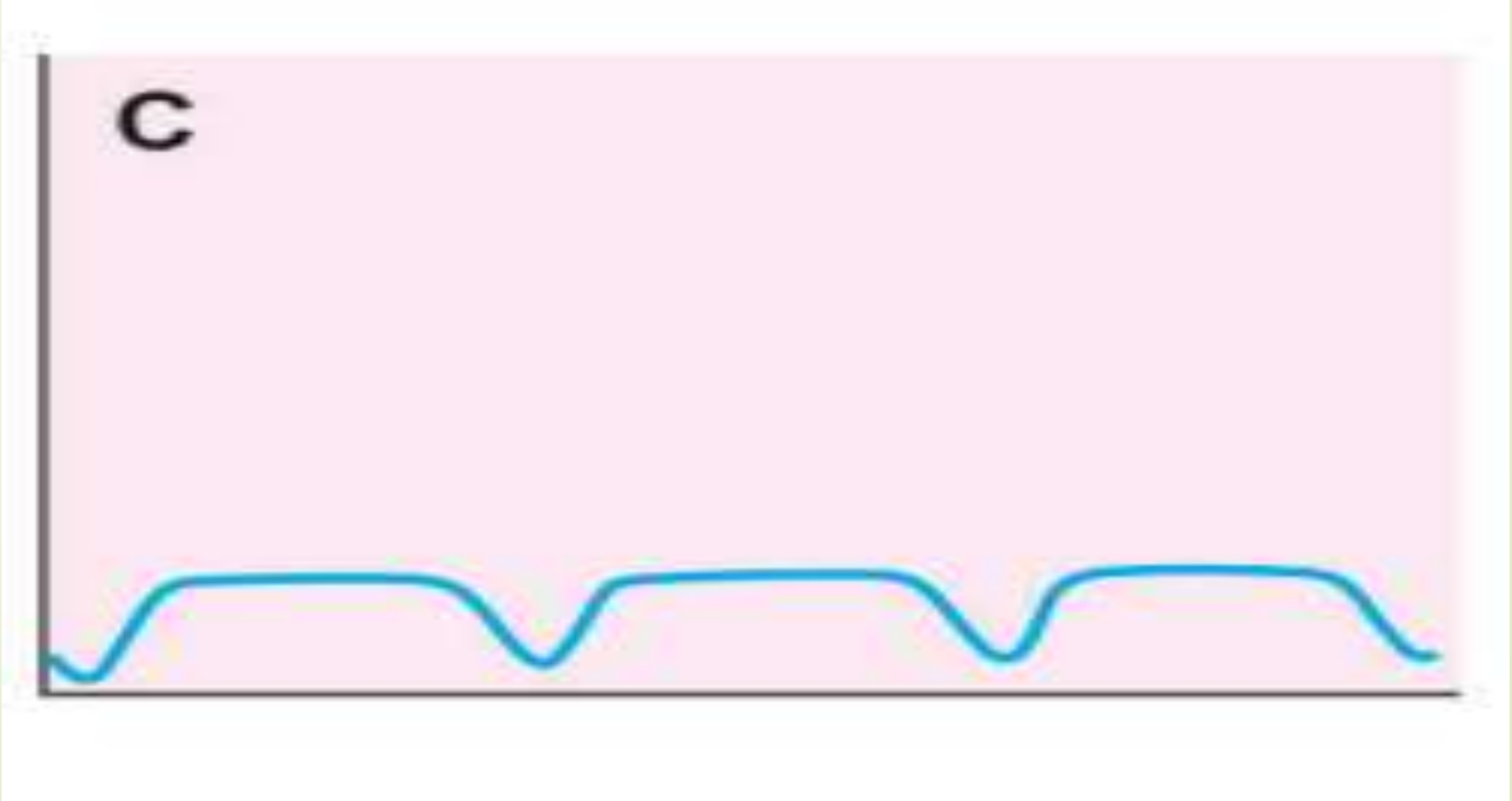
- Time capnogram and its components.
- Time capnogram showing segments, phases and angles.
- The inspiratory segment is phase 0
- The expiratory segment is divided into three phases: I, II, and III.
- The maximum value of CO_2 at the end of the breath is designated as end-tidal PCO_2 ($PetCO_2$). It is lower than arterial CO_2 by about 5 mm Hg

Prolonged phase II and steeper phase III suggestive of bronchospasm, or airway obstruction

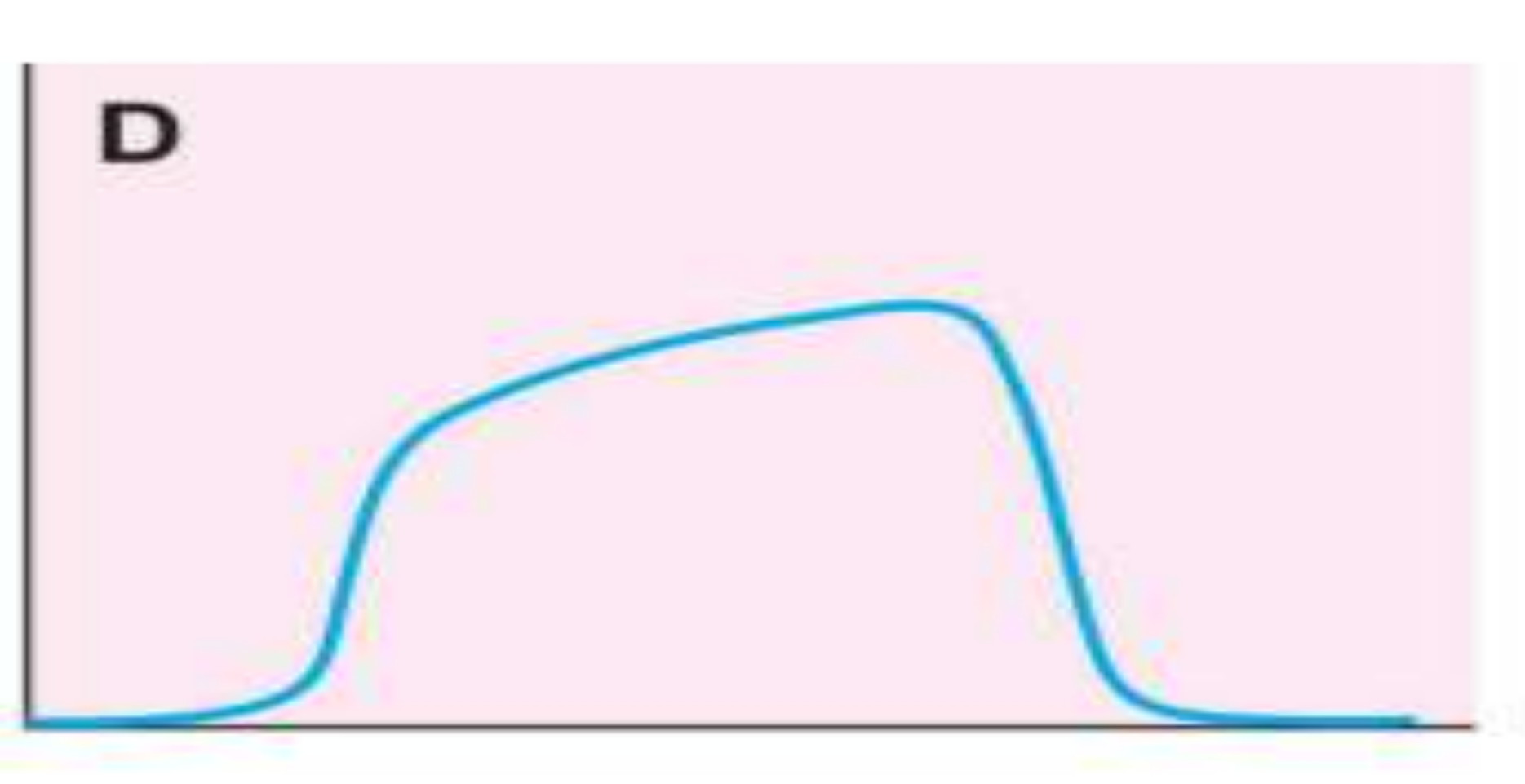


B. Expiratory valve malfunction resulting in elevation of the baseline This is due to rebreathing of expiratory gases from the expiratory limb during inspiration

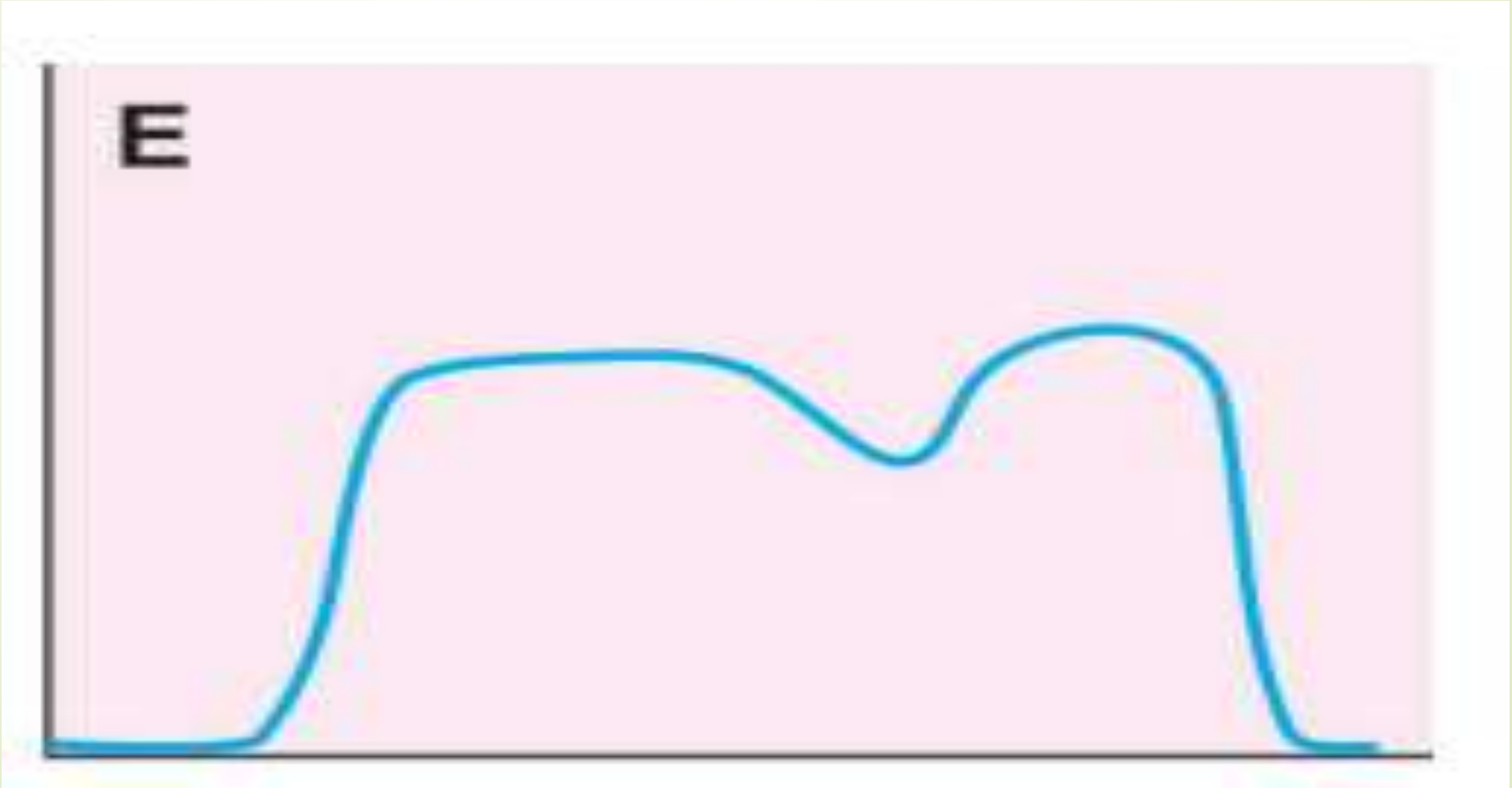
Inspiratory valve malfunction resulting in rebreathing of expired gases from inspiratory limb during inspiration



Capnogram with normal phase II but with an increased slope of phase III. Observed in pregnant subjects under general anesthesia.

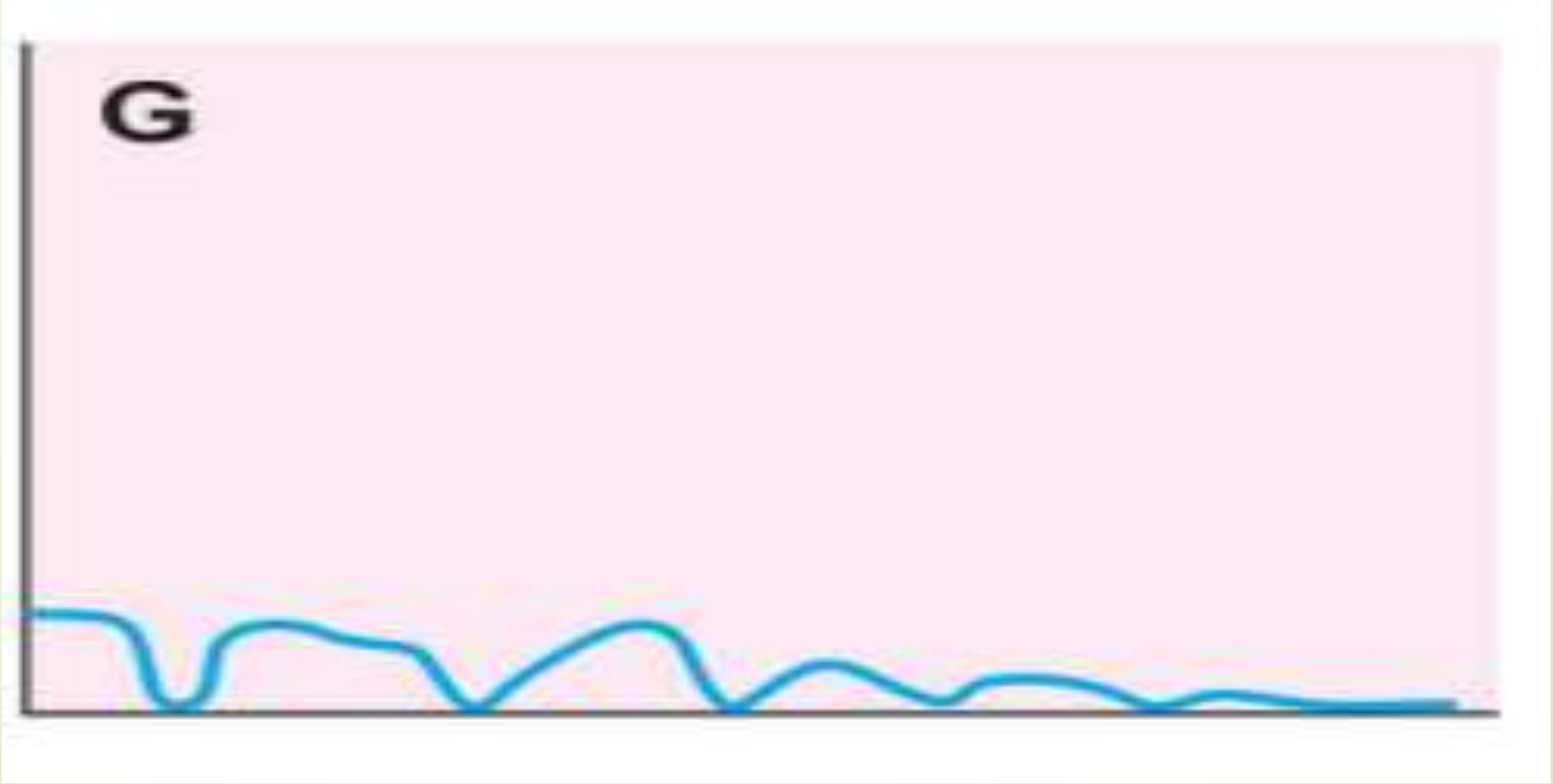


Patient is attempting to breathe during partial muscle paralysis. Surgical movements on the chest and abdomen can also result

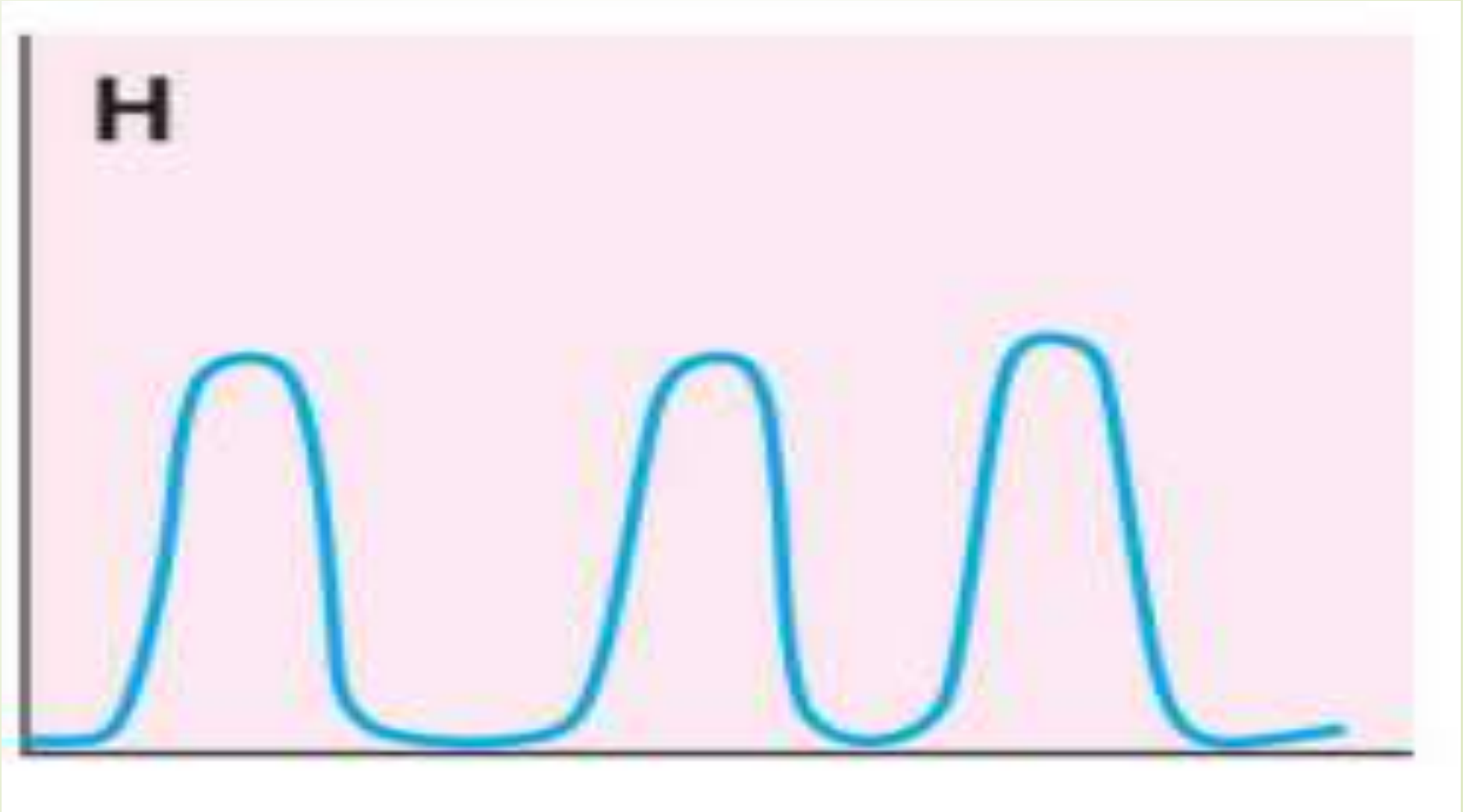


The baseline is elevated as a result of CO2 rebreathing

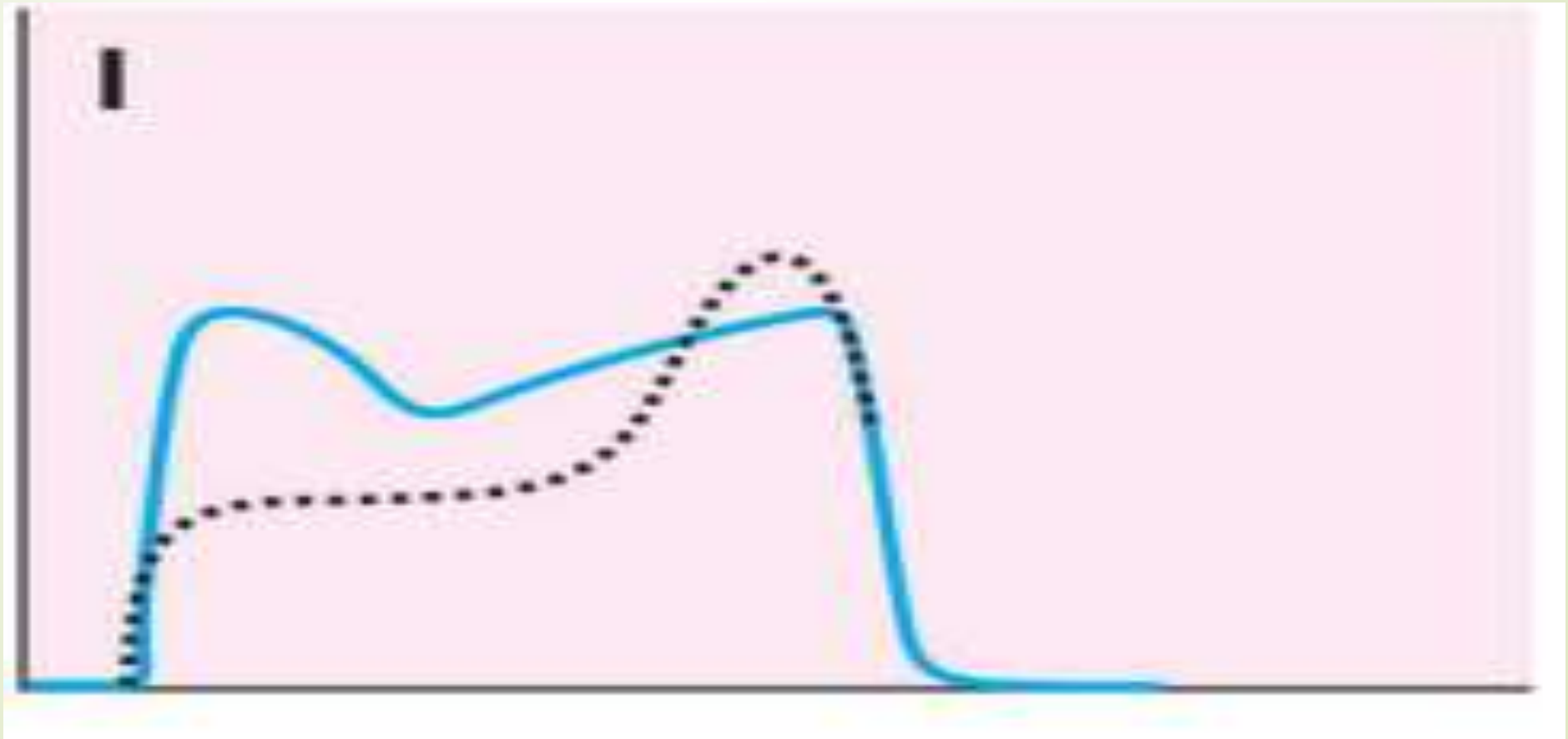
Esophageal intubation resulting in the gastric washout of residual CO2 and subsequent CO2 will be zero;



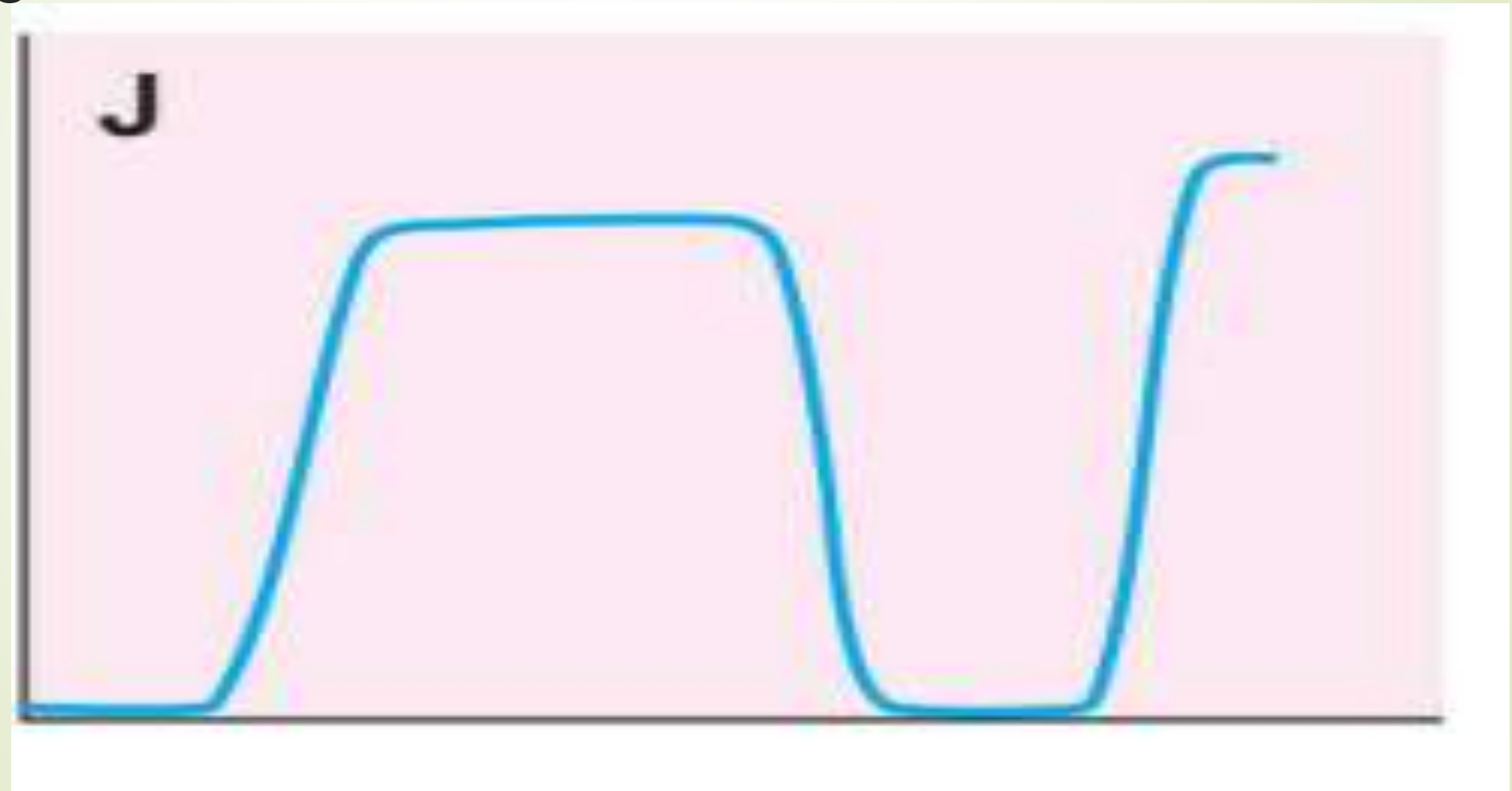
Spontaneously breathing capnograms where phase III is not well delineated



Dual capnogram in one lung transplantation patient. The first of peak of phase III is from the transplanted normal lung, whereas the second peak is from the native disease lung. A leak around the sidestream sensor port at the monitor can also result in a dual peaked capnogram. This is because of the dilution of expired PCO2 with atmospheric

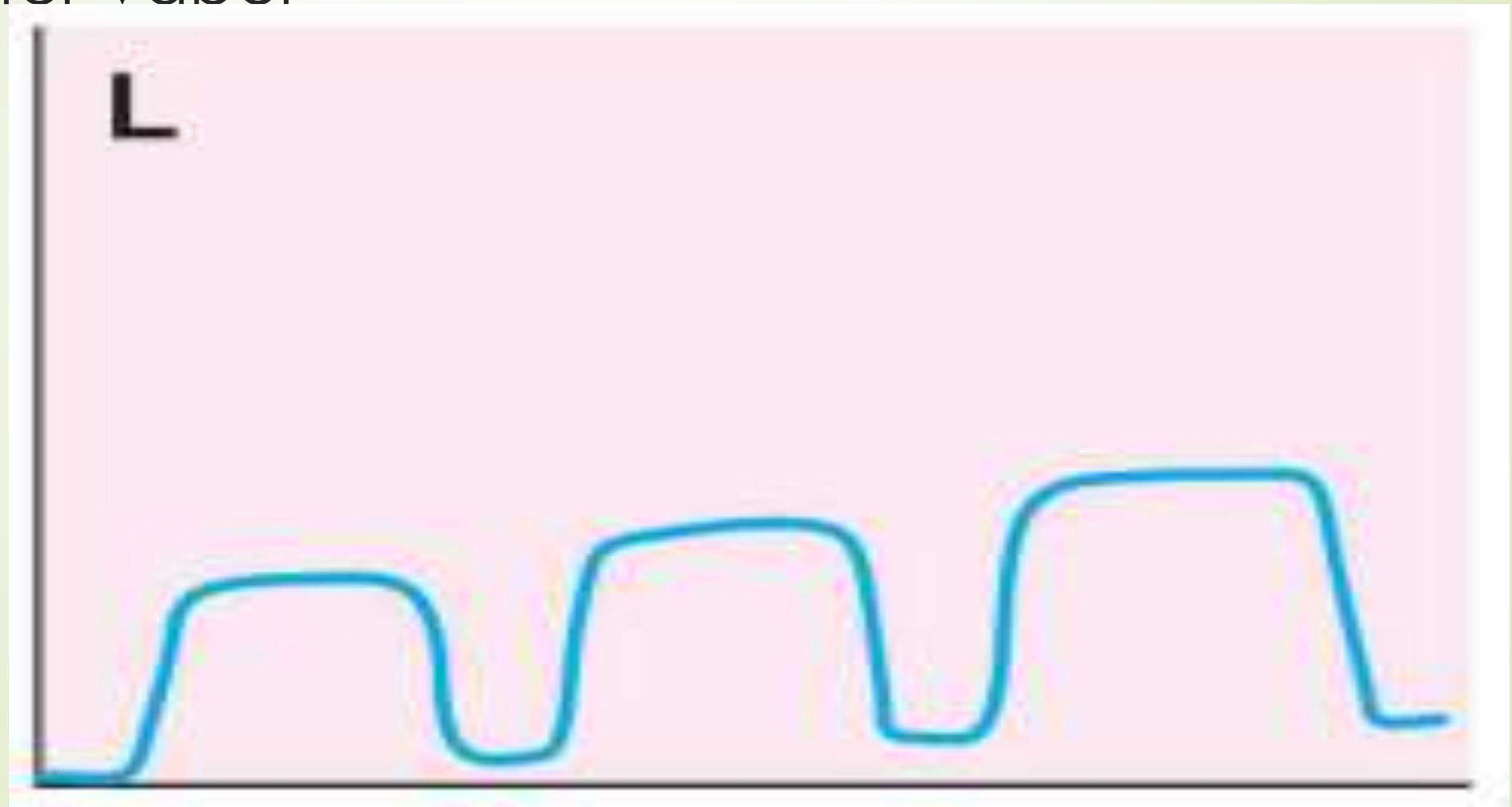


Malignant hyperpyrexia where CO2 is raising gradually with zero baseline suggesting increased CO2 production with CO2 absorption by the soda lime

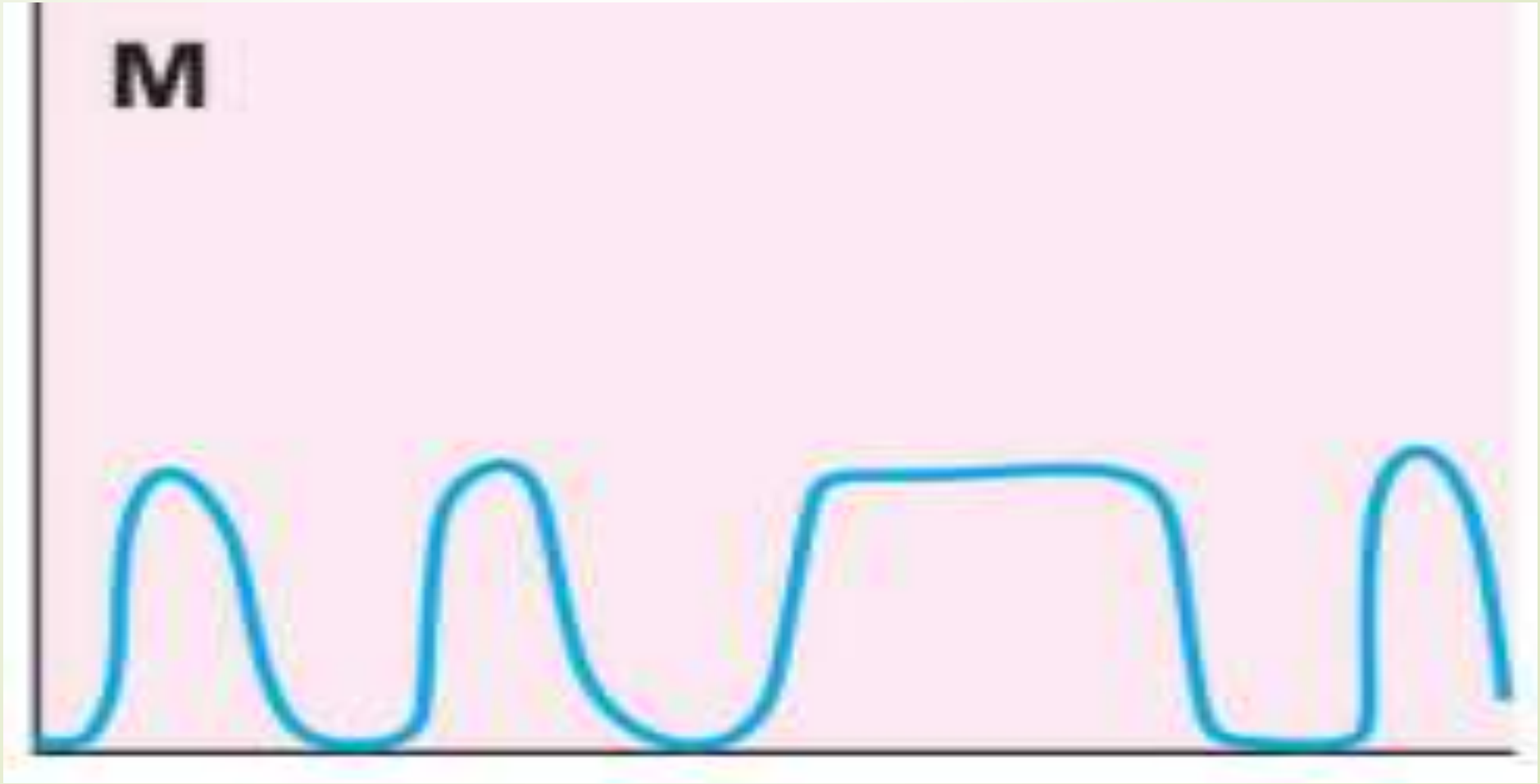


cardiogenic oscillations

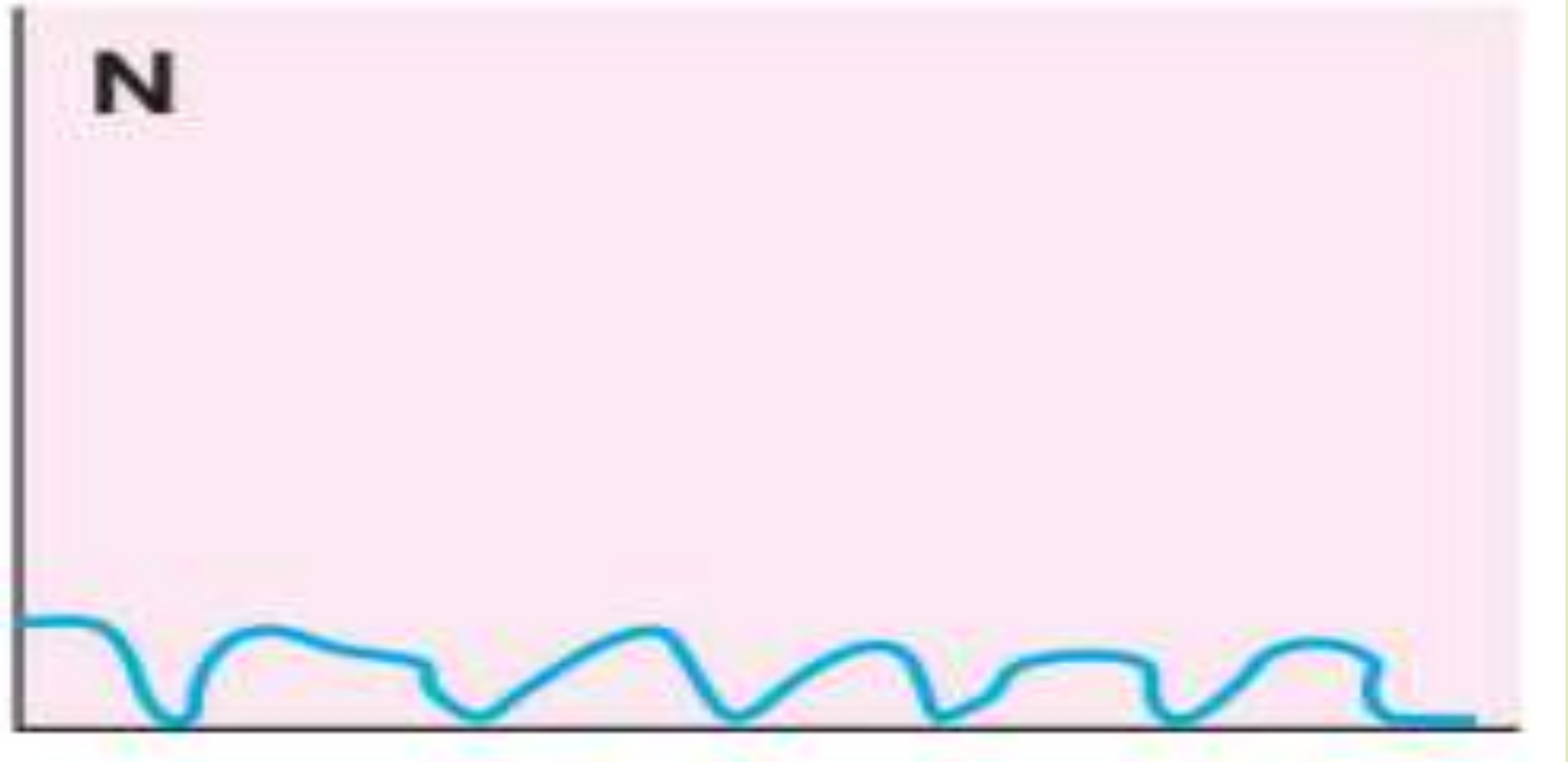
Sudden raise of baseline and the partial pressure of end-tidal carbon dioxide (PetCO2) due to contamination of the sensor with secretions or water vapor



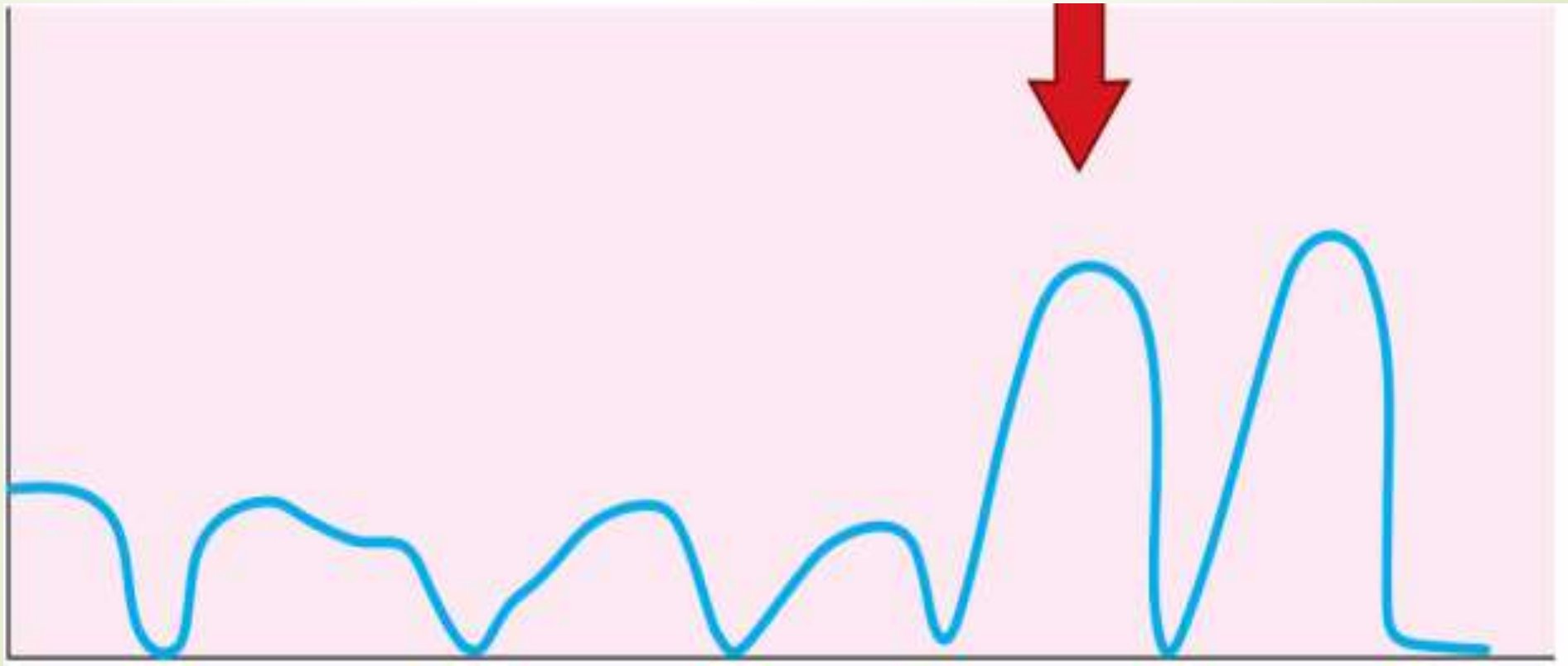
Intermittent mechanical ventilation (IMV) breaths in the midst of spontaneously breathing patient



Cardiopulmonary resuscitation: Capnogram showing positive waveforms during each compression suggesting effective cardiac compression generating pulmonary blood

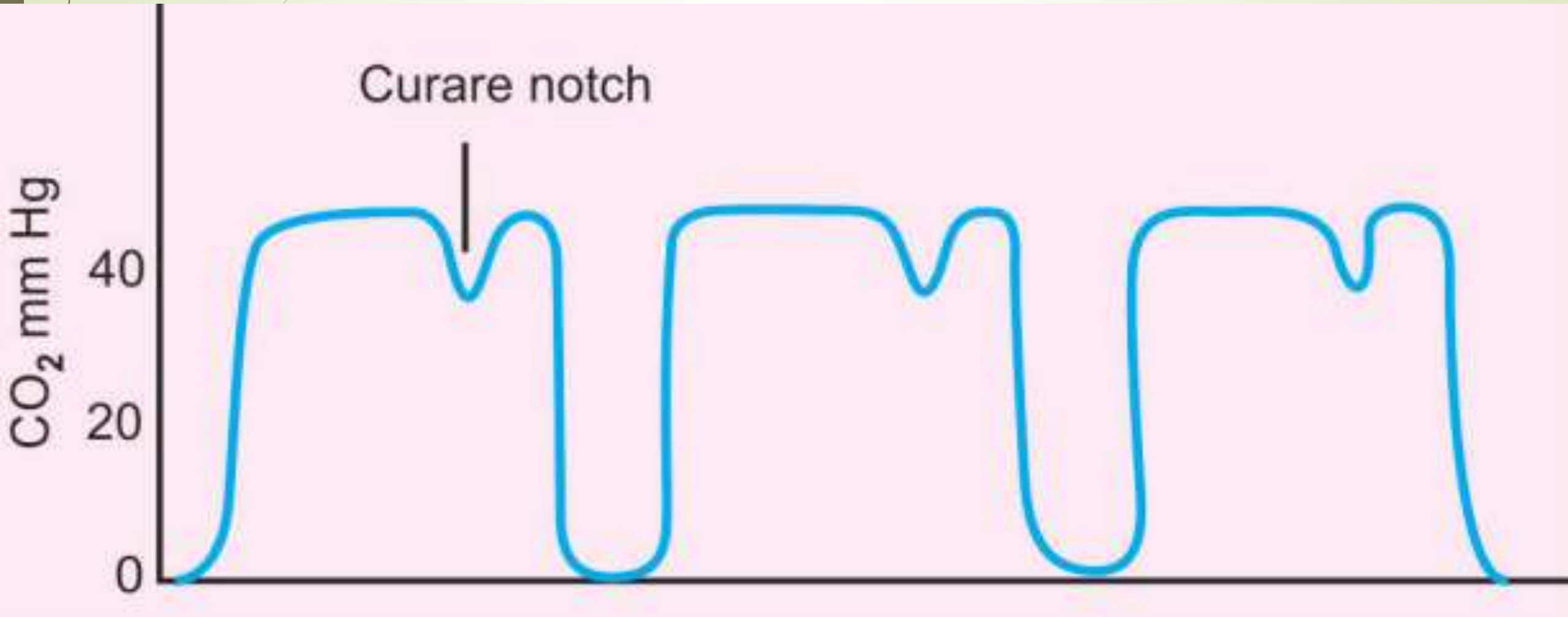


increase in partial pressure of end-tidal carbon dioxide (PetCO2) values suggest spontaneous return of circulation during cardiopulmonary resuscitation

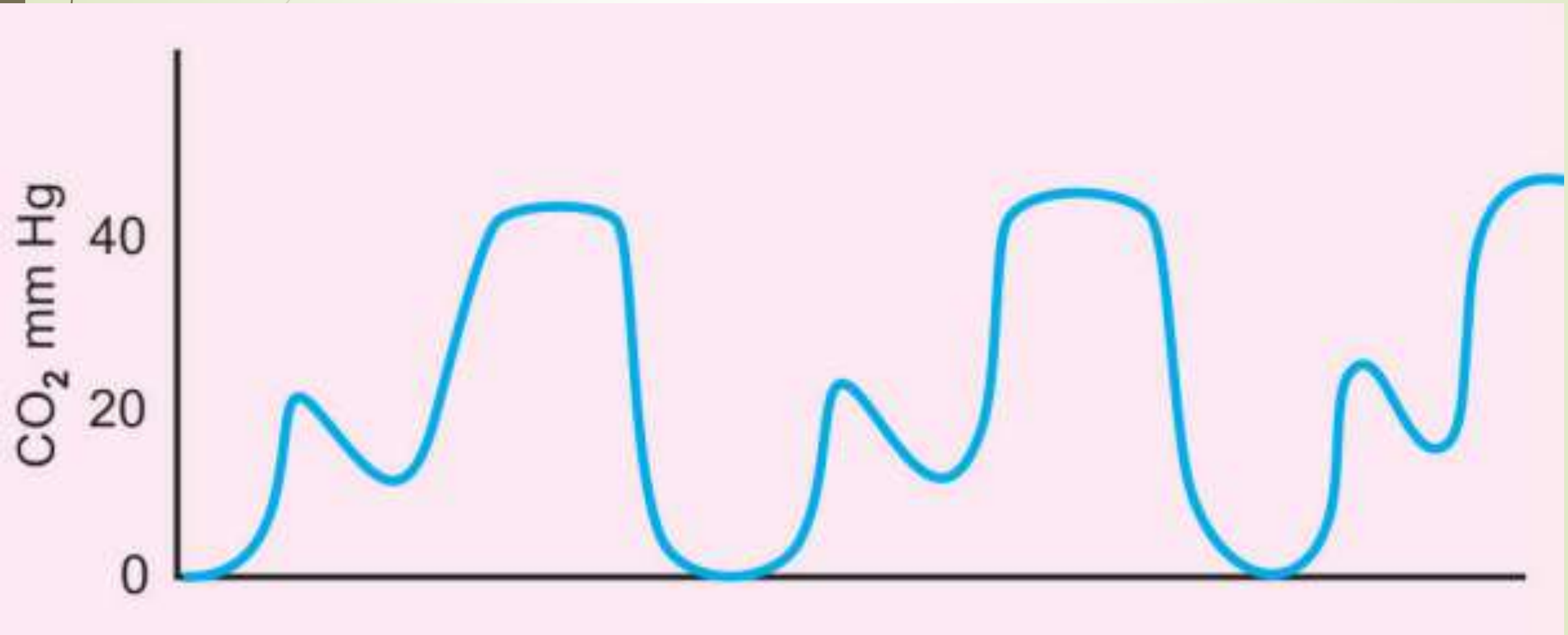


Capnogram showing rebreathing during inspiration.
This is normal in rebreathing circuits such as Mapelson D or Bain circuit

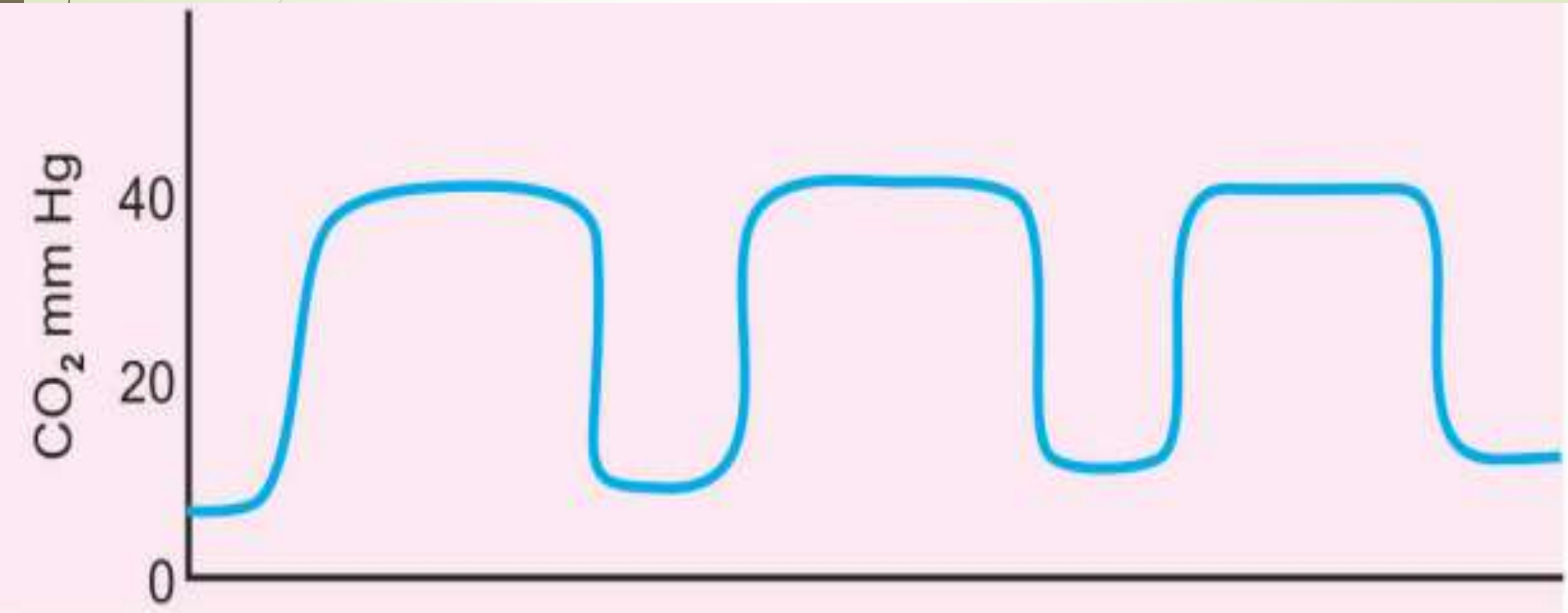
Home work



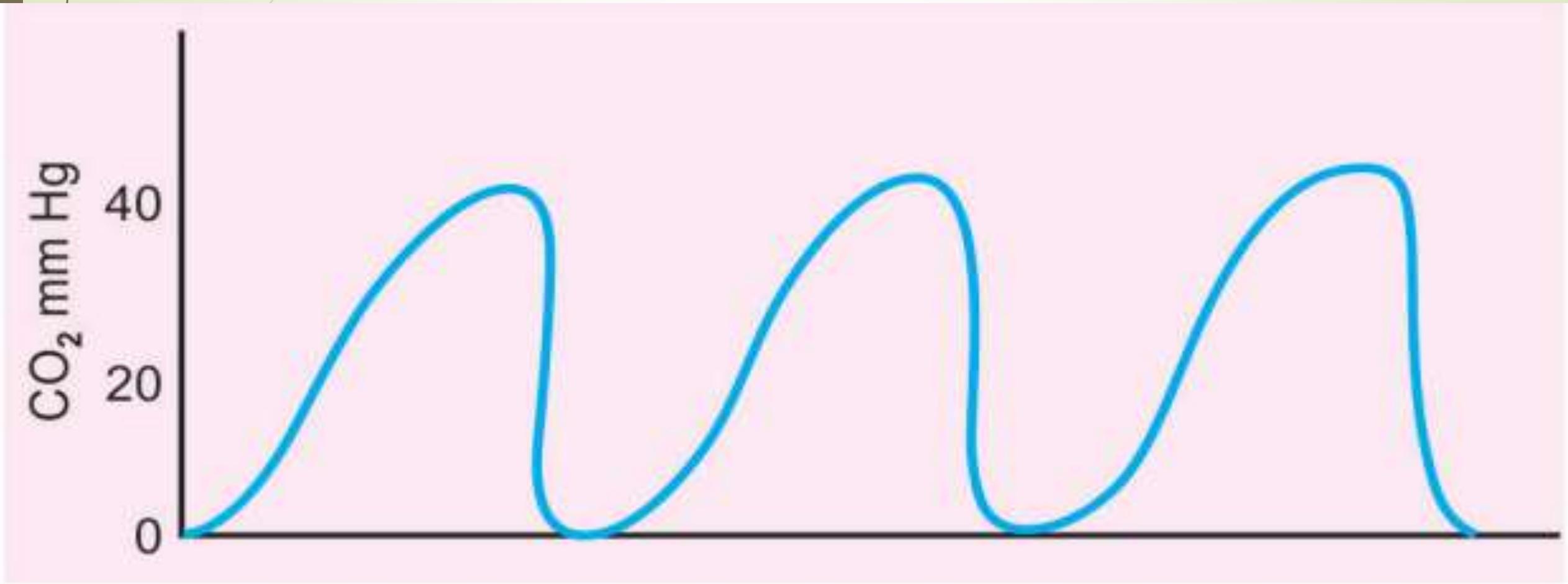
Home work



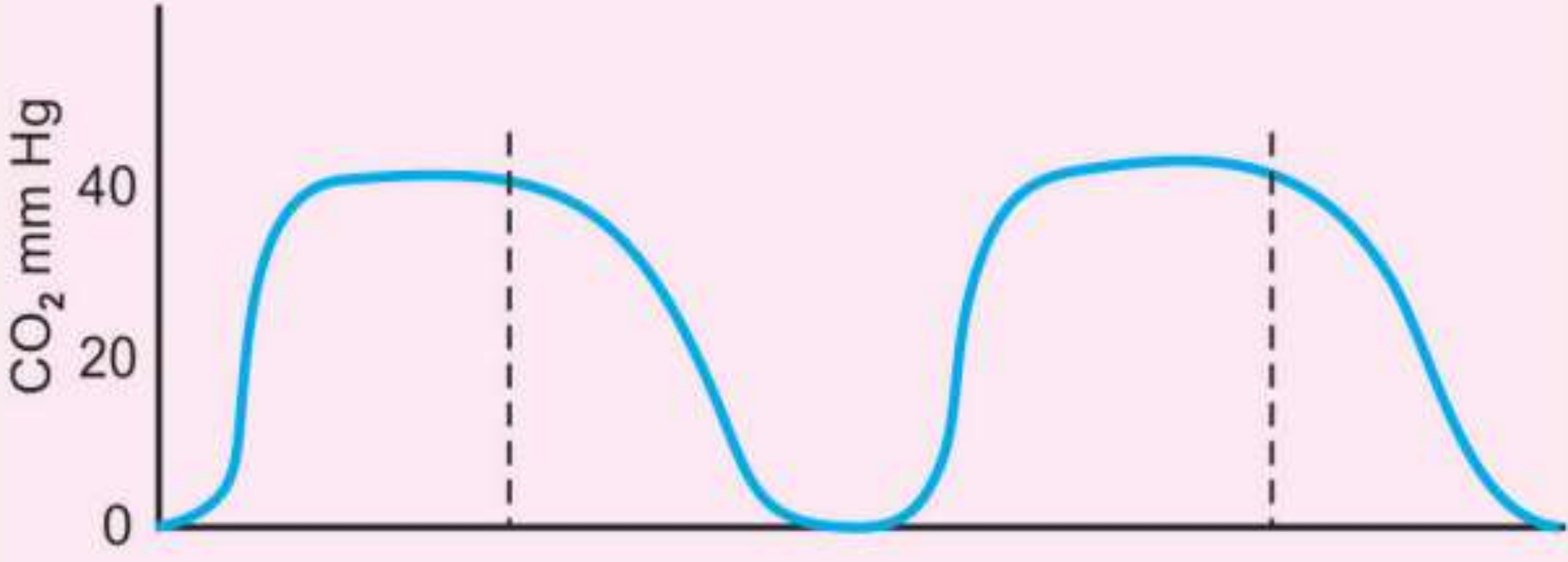
Home work



Home work



Home work



Thank you