Appendix 3. Glossary and Abbreviations
(Symbols and Common Units)

**Acidemia**: arterial blood pH below normal.
**Acidosis**: a process that tends to cause acidemia. Metabolic acidosis is primarily manifested by a decrease in blood bicarbonate. Respiratory acidosis is primarily manifested by an increase in blood PCO₂.
**Alkalemia**: arterial blood pH above normal.
**Alkalosis**: a process that tends to cause alkalemia. Metabolic alkalosis is primarily manifested by an increase in blood bicarbonate. Respiratory alkalosis is primarily manifested by a drop in blood PCO₂.
**Allometric relationship**: any relationship relating a variable to body weight (BW); usually represented in the log-transformed version.
**Altricial species**: species born at an early stage of development, therefore immature at birth.
**Anaerobic**: a process occurring in absence of air, and, specifically, in absence of oxygen.
**Anoxia**: absence of oxygen.
**Asphyxia**: the combined decrease in oxygen and increase in carbon dioxide, as, for example, during rebreathing of the expired air.
**Atelectasis**: alveolar collapse
**Baroreceptor**: a physiological structure sensing pressure; e.g. carotid sinus, sensing blood pressure.
**Bronchomotor tone**: the state of contraction of the smooth muscle in the airways.
**Capacity**: a quantity of two or more volumes; e.g. "Vital Capacity", the sum of inspiratory reserve volume, tidal volume and expiratory reserve volume.
**Carbon dioxide production**: amount of carbon dioxide produced per unit time (VCO₂, ml/min).
**Carbon dioxide stores**: the total amount of CO₂ stored in the body in all its forms (CO₂, carbonic acid, carbonate, bicarbonate, carbamino compounds, carboxy-hemoglobin). In an adult man estimated to more than 100 liters.
**Chemoreceptors**: receptors sensitive to chemical variations; e.g. carotid body sensing PaO₂.
**Coelomic cavity**: large intra-embryonic space extending from the thoracic to the pelvic region.
**Compliance**: reciprocal of elastance. Change in volume per unitary change in pressure.
**Conductance**: reciprocal of resistance. The flow generated by a unitary change in pressure (ml. sec⁻¹. cm H₂O⁻¹).
**Cost**: like work, is energy. Since, almost invariably, biological processes including respiration depend on oxygen, respiratory cost is commonly measured as respiratory oxygen consumption, or its caloric equivalent (1 ml O₂ is about 5 cal).
**Cyanosis**: bluish colouration of the skin and mucous membranes, when at least 5 g % of Hb is desaturated.
**Dead space**: Anatomic: total volume of the airways which do not participate to gas exchange, because of absence of gas exchange structures (ml). Physiologic: total volume of the airways not participating to gas exchange, either for anatomical or functional reasons.
**Density**: mass per unitary volume (g/ml).
**Elastance**: reciprocal of compliance, change in pressure per unitary change in volume.
**Efficiency**: ratio between work and cost. Hence, it is the ratio between energies, therefore a dimensionless number as long as both work and cost are measured using the same units.
**Energy**: capacity to perform work.
**Force**: the product of mass and acceleration. Newton is defined as the force necessary to accelerate 1 kg mass by 1 m/sec. Dyne is defined as the force necessary to accelerate 1 g mass by 1 cm/sec (=10⁻⁵ Newton).
**Functional residual capacity**: the amount of air left in the lungs at end expiration (ml).
**Hematocrit**: volume of blood cells expressed in percent of total blood volume (%).
**Hering-Breüer inflation reflex**: inhibition of inspiratory activity following lung inflation.
**Homeotherm**: animal with constant body temperature, to a large extent irrespective of changes in ambient temperature.

**Hyperbaria**: a condition of pressure higher than atmospheric pressure.

**Hypercapnia**: an increase in arterial PCO\(_2\).

**Hypoxemia**: a decrease oxygen in the arterial blood. The term is used for a decrease in either oxygen pressure or oxygen content.

**Hypoxia**: reduced oxygen, either concentration or pressure. Tissue hypoxia, decrease in tissue oxygenation; usually, but not always, accompanied by a reduction in arterial partial pressure of oxygen (PaO\(_2\), mm Hg)

**Hypocapnia**: decrease in arterial partial pressure of carbon dioxide (PaCO\(_2\), mm Hg).

**Hysteresis**: The influence of the previous condition (or history) on the subsequent response to a stimulus.

**Isocapnia**: at equal pressure of CO\(_2\).

**Mechanoreceptors**: receptors sensitive to mechanical stimuli, usually pressure or tension.

**Metabolism**: All the chemical transformations occurring within a living organism. ‘Anabolism’ often refers to the synthetic (usually energy-requiring) transformations. ‘Catabolism’ often refers to destructive (usually energy-yielding) transformations.

**Mixed venous blood**: a pool of venous blood from different body regions, e.g. the venous blood in the right atrium.

**Oncotic**: pressure generated by molecules of large molecular weight, e.g. proteins, in which case it is also called "colloid osmotic pressure" (about 28 mm Hg in human plasma).

**Ontogenesis**: The process of growth and development of an organism.

**Oxygen consumption**: amount of oxygen used by living matter per unit time (VO\(_2\), ml/min).

**Oxygen delivery**: product of cardiac output and arterial O\(_2\) content (ml O\(_2\)/min).

**Oxygen uptake**: amount of O\(_2\) removed from the environment (ml O\(_2\)/min). In steady state, it is equal to oxygen consumption.

**pH**: the negative decimal log of the hydrogen ions concentration

**Precocial species**: species born at a late stage of development, therefore more mature at birth.

**Prematurity**: birth at earlier than normal gestational age. For the human infant, <38 weeks.

**P\(_{50}\)**: partial pressure of O\(_2\) at which 50% of the hemoglobin is saturated (mm Hg)

**Perfusion**: amount of blood circulating per unit time (ml/min). If referred to the whole body, it corresponds to cardiac output.

**Pneumothorax**: collapse of the lung, or portion of it, because of a gas (usually air) in the pleural space.

**Poikilotherm**: an animal with body temperature (Tb) affected by the environmental temperature, hence, with fluctuating Tb.

**Power**: energy produced over a period of time (W/time).

**Pressure**: force applied over a surface area (P=F/A). 1 Pascal is defined as 1 Newton/cm\(^2\). In respiratory physiology, it is common to measure P as the height of a column of water or of mercury, relative to atmospheric P. Hence, common units are, respectively, cm H\(_2\)O or mm Hg (=1.36 cm H\(_2\)O, also called torr*).

[*strictly, torr is the pressure required to support a column of mercury 1 mm high, at 0°C and under a gravitational filed of 9.806 m/sec\(^2\)]

**Resistance**: reciprocal of conductance. The change in pressure required to generate a unitary change in flow (cm H\(_2\)O, ml\(^{-1}\). sec)

**Respiratory quotient**: ratio between \(\text{VCO}_2\) and \(\text{VO}_2\).

**Resting volume**: volume of the respiratory system when no forces are applied to it (ml).

**Tension**: force applied over a linear dimension (dyne/cm, or newton/m).

**Thermoneutrality**: the range in ambient temperature over which body temperature is maintained at the normal level with minimal oxygen consumption, in normoxia.

**Tidal volume**: volume of air inhaled with each breath (ml).

**Transpulmonary pressure**: pressure across the lungs, i.e. the pressure difference between the airways and the pleural space (cm H\(_2\)O).
**Ventilation**: amount of air mechanically exchanged per unit time (ml/min).

**Ventilator**: a machine capable of expanding the lungs for the purpose of gas exchange. Some are ‘positive pressure’ ventilator, connected to the airways, others are ‘negative pressure’ ventilators, which inflate the lungs by decreasing the pressure around the chest.

**Ventilatory equivalent**: ventilation per unitary change in oxygen consumption (VE/VO₂). Although both parameters are in ml/min, note that VE is BTPS, and VO₂ is STPD. The reciprocal (VO₂ / VE) reflects the amount of O₂ used per unit ventilation (ventilatory efficiency for oxygen).

**Vital Capacity**: maximal amount of air that can be exhaled after a full inspiration.

**Work (W)**: energy produced by a force acting through a distance (F . d). Hence, the product of pressure (F/surface area) and volume (d . surface area), also has the physical dimensions of work (W=P . V).

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**Standard Symbols and Abbreviations**

(Symbols in italics refer to a volume per unit time)

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<td>V</td>
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<td>f</td>
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<td>f , 10 breaths/min</td>
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<td>Fractional concentration of gas in the dry gas phase</td>
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<td>Respiratory Exchange Ratio</td>
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<td>D</td>
<td>Diffusing capacity</td>
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**Qualifying Terms: Gas:**

- A: Alveolar gas
- D: Dead Space gas
- T: Tidal gas
- I: Inspired gas
- E: Expired gas
- B: Barometric

**Qualifying Terms: Blood:**

- a: Arterial Blood
- v: Mixed venous blood
- v: Venous blood
- c: Capillary blood

**Other Terms Describing Gases:**

- atm: atmosphere (1 atm = 760 mm Hg = 10.33 m H₂O)
- ATPS: ambient temperature and pressure, saturated with H₂O
- BTPS: Body temperature and ambient pressure, saturated with H₂O
- STPD: Standard temperature (0 °C) and pressure (760 mm Hg), dry (PH₂O = 0 mm Hg)

**Breathing Patterns**

**Apnea**: absence or cessation of breathing in the resting expiratory position.

**Apneusis**: respiration ceases in inspiratory position, because of sustained contraction of the
inspiratory muscles.

**Biot's Respiration**: sequences of uniformlly deep gasps, apnea, then deep gasps.

**Breath-holding**: voluntary apnea, either by continuous contraction of the inspiratory muscles, or by relaxation against glottis closure.

**Cheyne-Stokes Respiration**: cycles of gradually increasing tidal volume followed by gradually decreasing tidal volume, usually separated by brief periods of apnea.

**Dyspnea**: difficult or laboured breathing; an uncomfortable awareness of the act of breathing, "air hunger".

**Eupnea**: normal spontaneous breathing.

**Hyperpnea**: increased pulmonary ventilation (above the normal resting value)

**Hyperventilation**: increase in pulmonary ventilation (\(VE, ml/min\)) (strictly, alveolar ventilation \(VA, ml/min\)) relative to metabolic rate, irrespective of the absolute value of ventilation.

**Hypopnea**: ventilation below the normal level.

**Hypoventilation**: ventilation less than required by metabolic demands, irrespective of the absolute value of ventilation.

**Orthopnea**: dyspnea experienced only in the recumbent position, usually supine, and relieved by sitting or standing. It often occurs in patients with left ventricular insufficiency.

**Panting**: breathing pattern both very rapid and shallow. In some conditions, this pattern is adopted to dissipate heat (thermal panting).

**Periodic breathing**, abnormal breathing pattern, with a series of cycles separated by pauses.

**Tachypnea**: increased rate of breathing.