# Definitions Dictionary

*(in, unfortunately, no particular order)*

- **Hypoxia** = When a lack of tissue oxygenation causes oxidative phosphorylation to cease
- **Sensitivity** ( *ability of test to exclude false negatives*) = true pos / true pos + false neg (tests with high sensitivity are good for screening)
- **specificity** (*ability of test to exclude false positives*) = true neg / true neg + false pos *( test with high specificity has low type-1 error rate)*
- **Positive predictive value:** *true positives / true pos + false pos*
- **Negative predictive value:** *true neg / true neg + false neg*
- **Viscosity** *(tendency of fluids to resist flow: = shear force / velocity gradient between adjacent fluid layers*)
- **Emulsion** (*a 2 phase system, consisting usually of a pair of immiscible liquids, one of which is dispersed in the form of small droplets throughout the other*) – need to state the order of the phases, eg oil:water emulsion etc
- **bioavailability** Proportion of administered drug which reaches the systemic circulation unchanged.
- **Potency** (*ability of a drug to produce a certain effect)*
- **Therapeutic index** ( $LD_{50}/ED_{50}$)
- **Half life:** *The time taken for a drug's concentration to decrease by 50% from the original (at 5 half-lives ~ 97% complete)*
- **Context Sensitive Half Time:** *The time for a drug's concentration to decrease by 50% after stopping an infusion that was designed to maintain steady state. (context refers to the duration of the infusion)*
- **Time constant ($\tau$ or Tau):** *Used to describe the rate of change of an ential process, and is the time at which the process **would** have been completed had the **initial rate** of change continued. An exponential process, e.g. flow of air into a lung unit, is 95% completed after 3 time constants.*
- **Exponential function =** *rate of change of a quantity at any time is proportional to quantity at that time. Time taken to complete is inherently infinite.*
- **Clearance:** *the volume of plasma which is cleared from a drug per unit time (ml/min)*
- **Elimination**: *The amount of drug removed from the body per unit time ( eg mg/min)*
- **Isomers:** *Two or more compounds with the same atomic composition ( ie same chemical formula), but differ from each other due to different structural **arrangement:***
  - structural isomers: *Compounds with same chemical composition, but different 2D **chemical** structures.*
  - Stereoisomers: *Same chemical formula and **chemical** structure, but different spatial arrangement around a chiral atom*
    - diastereomers: *are stereoisomers, but are not mirror images of each other*
    - enantiomers: *are stereoisomers, and are mirror images of each other.*
    - geometric isomers*: are stereoisomers which have double bonds or ring like structures*

- **Eutectic mixture:** *When two compounds are combined to give a substance which behaves with a single set of physical characteristics. Eg when crystalline bases of 2.5% lignocaine + 2,5% prilocaine are combined to form an eutectic mixture that has a lower melting point than either of the two individual ones, yielding an oil at room temp.*

- **Buffer:** *Solution which able to minimize changes in H+ when an acid or base added to it.Mixture of a weak acid and a conjugate base*

- **pH** *= logarithm to base 10 of reciprocal of H concentration*

- **Poynting** effect *( dissolution of gaseous O2 when bubbled thru liquid N2O, with vaporization of the liquid to form a gaseous 50% mixture of O2/N2O )*

- **ED95:** *dose of muscle relaxant that will depress the twitch height response of a peripheral nerve stimulator by 95%.*

- **MAC:** *The minimum alveolar concentration of volatile, used at one atmosphere and at equilibrium, that will prevent skeletal muscle movement in 50% of healthy volunteers in response to a supramaximal painful stimulus, eg a surgical skin incision and no other sedatives used.*

- **MAC-BAR:** *The minimum alveolar concentration of volatile (above conditions) which will prevent an autonomic response (↑BP or ↑HR) to a surgical skin incision in 50% of healthy volunteers ( no other drugs used to blunt response*).

- **MAC-awake:** *Min alveolar concentration at which a pt will open eyes to verbal command during emergence from anaesthesia, in 50% healthy volunteers (no other sedativa).*

- **MAC-intubation:** *MAC of volatile that would inhibit movement and coughing during endotracheal intubation in 50% healthy volunteers.*

- **MAC-hour:** *1 MAC of volatile for 1 hour = exposure to agent ( used to assess potential toxicity, eg metoxyflurane for 2 MAC-hours gives renal toxicity) [ note: running volatile at 0,5 MAC for 2 hrs = 1 MAC-hour, etc ]*

- **MAC-95**, Factors affecting MAC

- **Diffusion limitation** *= Rate of transfer of a gas across a membrane, independent of partial pressure gradients*

- **Conscious Sedation:** *drug induced depression of consciousness during which patient respond purposefully to verbal command of light tactile stimuli*

- **Sedation**: *Where drug or dose of drug decreases activity, soothes + calms and moderates excitement without inducing sleep*. (*State of reduced consciousness in which verbal contact with pt **may** be maintained).*

- **QTc** *= QT/√R-R interval*

- **Hypnosis (drug induced):** *Where drug induces near natural sleep on EEG , though REM sleep is suppressed.*

- **Anxiolysis:** *Where drug reduces anxiety without impairing other cerebral or motor fx's ( thus, minimal GCS alteration).*

- **Tachyphylaxis**: *acute decrease in response to repeated dose of a drug*
- **Tolerance:** *progressive decreasing response to repeated dosage of drug*
- **Dependence:** *Propensity to experience an abstinence syndrome after discontinuation of a drug, or after administration of an antagonist drug (a.k.a.* ***Physica****l dependence – but manifests with physical & physycological symptoms)*
- **Addiction:** *a chronic state, characterized by the compulsive use of a substance resulting in harm (physical, psychological or social) and continued use despite harm (a.k.a.* ***psychologica****l dependence)*
- **Competitive antagonists** *(compete at same receptor with agonist)***: - Reversible + Irreversible**
- **Non-competitive antagonist:** *eg; where the antagonist blocks at some point the chain of events that leads to response by the agonist ( not competing directly with the R) eg CCB's prevent influx of calcium thru cell membrane and thus blocks non-specifically the contraction of smooth muscle produced by other drugs. Also, physiological antagonism, pharmacokinetic antagonism.*
- **Physiological antagonist***: the interaction of two drugs whose opposing actions in the body tend to cancel each other ( eg histamine + adrenaline; histamine + omeprazole; glucagons + BB's; calcium and potassium)*
- **Receptor**: *Is a component of a cell (usually a protein) that interacts selectively with an extracellular compound to initiate a cascade of biochemical events that result in the observed effects of the compound.* (from Miller)
- **Hormone** *(chemical messenger produced by ductless glands , gets released into circulation + travels to distant target cells where it acts via specific protein receptor at these cells ( nuclear/cytosolic or membrane)*
- **second messenger** *= formed as a result of a hormone/receptor interaction which acts intracellularly to effect an action*
- **Autacoid** *(chemical messengers that act on target cells close to site of release ( a.k.a. local hormones or paracrine secretions) . e.g. PG's + histamine*.
- **Sleep** *(a naturally occurring state of unconsciousness. Response to external stimuli is decreased, but still readily rousable)*
- **p50** = index of O2 affinity of oxygen carrying protein (*partial pressure at which Hb is 50% saturated. HbA = 27mmHg, HbF = 18 mmHg, myoglobin = 2,7 mmHg*)
- **Bohr effect** *(decreased affinity of Hb for oxygen in presence of ↑ $PCO_2$ . Majority of Bohr effect is actually due to an ↑ in blood $H^+$) ↓ affinity for O2 = R-shift of OHDC*
- **Haldane effect** *(The increased affinity of Hb for $CO_2$ as it gets deoxygenated* )
- **Compliance** *( = change in volume per change in pressure)*, **elastance** *(change in P per change in volume)*
- **Specific Compliance** = *compliance / FRC*
- **Dead space**: **anatomical** (*The volume of the conducting airways)*, **alveolar** (*The volume beyond the conducting airways which does not participate in gas exchange)*, **physiological** (*That part of the tidal volume which does not participate in gas exchange, ie = anatomical + alveolar dead space )*

- **Ventilation** (*change in volume / unit resting volume of lung*)
- **FRC** (*volume remaining in lung at end of N tidal expiration*) (RV + ERV)
- **Closing volume:** (*The lung volume from the beginning of airway closure to the end of maximal expiration.)*
- **Closing capacity:** (*lung volume at which small airways in the dependant parts of the lungs start closing during expiration)*
- **True Shunt =** *blood entering arterial system without passing through ventilated areas of the lung (no way to accurately calculate this)*
- **ANZCA Shunt =** *Blood draining from lung units with V/Q ratio <1*
- **Venous admixture (or virtual shunt):** *The amount of mixed venous blood that would have to be added to pulmonary end-capillary blood to give the observed difference between end-capillary and arterial $PO_2$ values. (thus also called an "as-if shunt").*
- **Pasteur point** (PO2 below which oxidative phosphorylation cannot continue, ~ 1mmHg )
- **Respiratory quitient** (RQ) (*The ratio of the volume of CO2 produced to the volume of O2 consumed per unit of time, at steady state. Ie* $V_{CO2}/V_{O2}$ ) vs **Respiratory exchange ratio** (R) (*the ratio of volume of CO2 produced to volume O2 consumed per unit time at any given instant, whether or not equilibrium has been reached).*
- **cyanosis** = *when capillary blood contains >5g/dl deoxyHb*
- **Preload** (*initial fiber length or myocardial load immediately before contraction*), **afterload** (*The impedance to the ejection of blood into the arterial circulation)*, **contractility** (*the factor responsible for changes in myocardial performance which are not due to changes in HR, preload or afterload*)
- **impedance =** *the effective resistance of an electric circuit or component to **alternating current**, arising from the combined effects of ohmic resistance and reactance.*
- **MAP** *( ave arterial P over a single cardiac cycle)*
  *= Diastolic pressure + 1/3 pulse pressure*
  *= CO x SVR*
- **Autoregulation** *The ability of organs to ensure adequate perfusion in the face of changes in perfusion pressure ($\Delta P$) and / or changes in metabolic demand, by means of local mechanisms only*
- **Tubuloglomerular feedback:** *An intrarenal mechanism that primarily regulates GFR so that it remains constant ( changes in renal blood flow is a secondary consequence of it, and is a form of autoregulation of renal flow).*
- **Glomerulotubular balance:** *An intrarenal mechanism ensuring that a constant percentage of* $Na^+$ *gets reabsorbed.*
- **Pain** ( *unpleasant sensory or emotional experience associated with, or described as, actual or potential tissue damage*

- **Calorie:** *One calorie = the amount of heat energy necessary to raise the temperature of 1g water by 1 degree celcius, from 15 – 16 degrees*
- **Oxydative phosphorylation:** *production of ATP associated with **oxidation** by the flavoprotein-cytochrome system in mitochondria.*
- **Fick principle:** *The rate of uptake (or output) of a substance from an organ is equal to: the flow to the organ times the a-v concentration difference of that substance.* $V_x = Q(a_x - v_x)$
- **Fick's law of diffusion:** *The rate of diffusion of a substance across a unit area is proportional to its concentration gradient.* Js = D.A. $\Delta c/\Delta x$
  (*Js = rate of diffusion, A = surface area,* $\Delta c$ *= concentration gradient,* $\Delta x$ *= thickness of membrane, and D = a constant = ~ solubility /* $\sqrt{mw}$ *)*
- **Graham's law:** *rate of diffusion of a gas is inversely proportional to the square root of its molecular weight (mw)*
- **Anion Gap** [ (Na +K) - (Cl+ HCO3) ] Normal = 8-12 mmHg
- **Osmolar gap:** *Measured osmolality minus calculated osmolality ( calculated =* $2xNa^+$ *+ urea + glucose)*
- **Thermoneutral zone** ( *Temp range over which VO2 is minimized*)
- **Interthreshold range** (*range of core temp's at which no autonomic thermoregulatory response triggered. (normally 0.2 – 0.5 degrees). Sweating occurs at the upper border and vasoconstriction at the lower border of this range)*
- **temperature** (*measure of the thermal state of substance*) vs **heat** (*a form of kinetic energy + can be transferred*)
- **Boiling point** (***temp*** *at which SVP of liquid equals atmospheric pressure*)
- **Colligative properties:**(*those properties of a solution that depend only on the particle concentration, ie the number of particles per volume. They are: SVP depression, boiling point elevation, freezing point depression + osmotic P*)
- **Critical Temp** *(temperature, **above** which a substance cannot be liquefied, no matter how much pressure is applied).*
- **Critical Pressure:** *( pressure required to liquefy a vapour at its critical temperature)*
- **Vapour:** *Matter in a gaseous form below its critical temperature*
- **Gas:** *Matter in a gaseous form above its critical temperature.*
- **pseudocritical T** *(in a mixture of gases, there's a specific critical T at which mixture may separate out into its constituents , = dep on P + T)*
- **Partial pressure** of a gas: *( = the pressure exerted by each component of a gas mixture)* Note: for a gas dissolved in liquid, the term **tension**, is used *( tension = same as the partial pressure of the gas with which it is in equilibrium with above the surface of the liquid)*

- **Gauge P:** = *P above or below atmospheric pressure* **vs Absolute P**: *= gauge P + atmospheric P*
- **Filling ratio**: *Mass of gas in a cylinder divided by the mass of water needed to fill it.* ( = used to describe how much gas is used to fill the cylinder)
- **Transducer** (*device that converts energy from one form to another*)
- **Damping:** *Any effect that tends to reduce the amplitude of oscillations of an oscillatory system.*
- **Resonance** *Is the tendency of a system to oscillate with greater amplitude at certain frequencies ie resonant frequencies. The system stores vibrational energy.*
- **Natural frequency** *Is the frequency at which a system tends to oscillate in the absence of a driving or damping force*
- **Boyle's Law:** *At a constant temperature, the **volume** of a gas is inversely proportional with the absolute **pressure**.*
- **Charles's Law:** *At constant pressure, the **volume** of given gas is directly proportional to the absolute **temperature**.*
- **Henry's law:** *At a given temp, the amount of a given gas dissolved in a given liquid, is directly proportional to the partial pressure of the gas in equilibrium with the liquid.*
- **Dalton's law:** *In a mixture of gases, the pressure exerted by each gas is the same as that which it would exert if it occupied the container alone.*
- **La Place's Law:** *The pressure inside a sphere (or hollow tube) is directly proportional to the surface tension and indirectly proportional to the radius*.
  - For a cylinder: P = T/r
  - For a sphere with 1 fluid lined surface: P = 2T/r (eg = **alveolus or heart)**
  - For a sphere with 2 fluid lined surfaces: P = 4T/r ( eg a soap bubble)
    - Also note: Tension (T) = wall Stress(**S**) x wall thickness (w) ( for a *thin* walled sphere, T is thus ~ S )
    - In the heart, an increased afterload causes an increase in wall stress (and hence $O_2$ demand).
    - For a given wall tension (T), an increase in wall thickness (w), will decrease the wall stress (S) ( ie compensatory ventricular hypertrophy)
    - Thus: P = 2T/r = 2S.w/r
      S = P.r/2.w

  ( thus, increased $O_2$ demand with ↑ arterial pressure and ↑ ventricular radius, and ↓ demand with ↑ w)
- **Law of mass action***: Rate of chemical reaction = proportional to the **product** of the concentrations of reactants*
- **Beer's law***: amount of light absorbed is proportional to the concentration of the absorbing substance*
- **Lambert's law:** *amount of light absorbed is proportional to the length of the path light has to travel in the absorbing substance.*
- **Absolute humidity**: *= mass of water vapour present in a given volume of air at a given temperature (mg/l or g/$m^3$ )*
- **Relative humidity:** *Is the ratio of the mass of water vapour in a given volume of air to the mass required to saturate that given volume of air at the same temperature. (given in % )*

- **Saturated Vapour Pressure (SVP):** *the pressure of a vapour which is in equilibrium with its liquid phase. SVP = atmospheric pressure at boiling point. SVP does not change with altitude.*
- **Vapour pressure** *= Pressure exerted by the molecules escaping a liquid into gaseous phase*
- **Osmosis:** *Movement of solvent molecules across a semipermeable membrane from a dilute solution to a concentrated one, so to equalize concentrations on both sides.*
- **Osmotic Pressure:** *The hydrostatic pressure required to* **prevent** *movement of* solvent *molecules by osmosis across a* semipermeable *membrane.*
- **Viscosity:** *the shear stress dived by shear rate between layers in a flowing gas or fluid.*
- **Shear stress:** *the shearing or sliding force applied per unit area of contact between two laminae ($N.m^{-2}$)*
- **Shear rate:** the change in velocity per unit distance radially ($N.s.m^{-2}$)
- **Osmolarity:** *The number of osmoles of solute per liter of solution (affected by temperature and volume of solute)*
- **Osmolality:** *The number of osmoles of solute per kg of solution ( not affected by temperature or volume of solution).*
- **Tonicity:** *= the* **effective** *osmolality of a solution = equal to the sum of the [ ]'s of the solutes which have the capacity to exert osmotic force across the membrane concerned (ie those which do not freely move across the membrane concerned).*
- **1 mole** *= amount of any substance which contains as many elementary entities as there are atoms in 12g of carbon 12*
  *= avogrado's no = 6 x $10^{23}$ elementary entities of the substance*
- **1 osmole** *= number of moles of solute that contribute to the osmotic pressure of a solution*
- **Venturi:** *= where flow occurs in a tube with a constriction in which the cross section gradually decreases and then*
  *Increases.*
- **Bernouli effect**: *= a fall in pressure during flow at a constriction in a tube.*
- **Entrainment:** *Air or fluid can get entrained through a side tube at a venturi, because of the drop in pressure.*
- **Thrombosis** *= pathological activation of haemostatic mechanisms in uninjured vessels or minor injury*
- **Haemostatsis =** *physiological process of maintaining blood in a fluid clot free state in normal vessels or producing rapid localized coagulation at the site of an injured vessel*
- **Anticoagulants** *= drugs which inhibt or prevent the action/propagation of the coagulation cascade*
- **Antithrombotics =** *drug which impair platelet adhesion/activation/aggregation*
- **IV induction agent** *= agent which will induce low of consciousness in 1 arm brain circulation time*
- **Blood Gas Partition Coefficient** *= ratio of anaesthetic agent in equilibrium at 37 deg ie contains the same partial pressures between the 2 phases. eg 0.47 = 1 ml of blood contains 0.47 of the alveolar concentration*

- **Hufner's number** *= 1.34. is the amount of oxygen which can combine with 1 gram of Hb when it is fully saturated*
- **Digestion** *= process which breaks dietary macromolecules into smaller more readily absorbed compounds*
- **Hysteresis =** *is the dependence of a system not only on its current environment but also on its past environment.*
- **Sleep =** *natural occurring state of reversible unconsciousness which person is rousable from by external stimuli. necessary for life.*
- **GA** *= pharmacologically induced state of reversible unconsciousness which creates amnesia, anaesthesia, ↓mm tone*
- **Peristalsis** *= radially symmetrical contraction & relaxation of mm propagating wave in muscular tube in anterograde fashion*
- **Vitamin** *= organic substance, not produced in body, essential for survival as affects specific biochemical reactions (is not used as an energy source)*
- **Starling Mechanism =** *invitro observation that in presence of fixed contractility and afterload, end systolic volume will remain the same despite changing preload.*