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\textsubscript{50}/ED\textsubscript{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 (τ or Tau)**: Used to describe the rate of change of an enthal 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. **Physical** dependence – but manifests with physical & psychological 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. **Psychological** 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; glucagon + 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). eg. 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 ↑ PCO2. 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 CO2 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:** (lungs volume 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 PO₂ values. (Thus also called an "as-if shunt").

• **Pasteur point** (PO₂ below which oxidative phosphorylation cannot continue, ~ 1mmHg )

• **Respiratory quotient (RQ)** (The ratio of the volume of CO₂ produced to the volume of O₂ consumed per unit of time, at steady state. i.e. VCO₂/VO₂) 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 (ΔP) 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 celsius, 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. \( V_r = Q(a_v - v) \)

- **Fick’s law of diffusion:** The rate of diffusion of a substance across a unit area is proportional to its concentration gradient. \( J_s = D.A. \Delta c/\Delta x \)
  - \( J_s \) = rate of diffusion, \( A \) = surface area, \( \Delta c \) = concentration gradient, \( \Delta x \) = thickness of membrane, and \( D \) = a constant = ~ solubility / \( \sqrt{\text{mw}} \)

- **Graham’s law:** rate of diffusion of a gas is inversely proportional to the square root of its molecular weight (mw)

- **Anion Gap** \[ (\text{Na}^+ + \text{K}^+) - (\text{Cl}^- + \text{HCO}_3^-) \] Normal = 8-12 mmHg

- **Osmolar gap:** Measured osmolality minus calculated osmolality ( calculated = \( 2x\text{Na}^+ + \text{urea} + \text{glucose} \))

- **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 liquify 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**: $P_{\text{above or below atmospheric}}$ vs **Absolute P**: $P_{\text{gauge}} + P_{\text{atmospheric}}$

• **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: $P = \frac{T}{r}$
  - For a sphere with 1 fluid lined surface: $P = \frac{2T}{r}$ (eg = alveolus or heart)
  - For a sphere with 2 fluid lined surfaces: $P = \frac{4T}{r}$ (eg a soap bubble)

  o Also note: Tension ($T$) = wall Stress ($S$) x wall thickness ($w$) (for a thin walled sphere, $T$ is thus $\sim S$)
  o In the heart, an increased afterload causes an increase in wall stress (and hence $O_2$ demand).
  o For a given wall tension ($T$), an increase in wall thickness ($w$), will decrease the wall stress ($S$) (ie compensatory ventricular hypertrophy)
  o Thus: $P = \frac{2T}{r} = \frac{2S.w}{r}$
  $S = \frac{P.r}{2.w}$

  (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 a 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 divided 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
  = avogado’s no = 6 x 10²³ 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.

- **Bernoulli 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 inhibit 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.