

* HUMAN Physiology

Respiratory organs -

- Simple diffusion - sponges, coelenterates
- entire body surface Flatworms.
- Moist cuticle - Earthworm
- Tracheal tubes - insects (Cockroach)
- Gills (branchial respiration) - Aquatic arthropods (fishes) (tadpole) & molluscs. [Crustacea] (Prawn) (cutaneous respiration)
- Lungs (pulmonary respiration) - Terrestrial forms. (amphibia, reptiles, birds & mammals)
- Book Lungs - Arachnids (scorpion & spider)
- Parapodia - Nereis

Excretory structures -

- Protonephridial Flame cells / Solenocytes - Platyhelminthes, rotifers, Cephalochordate (Amphioxus)
- Nephridia - Earthworms, Leech, Nereis
- Malpighian tubule - insects (Cockroach)
- Antennal gland / green gland - crustaceans (Prawn)
- coxal gland - Arachnids (scorpion, spider)
- Proboscis gland - Hemichordate (Balanoglossus).

Circulatory pathways -

- Open type - Arthropods & molluscs except Cephalopoda
- closed type - Annelids & chordates except tunicata (urochordata)
- 2 chambered heart - Fishes
- 3 chambered heart - Amphibians & Reptiles
- 4 chambered heart - Crocodiles, birds, mammals.

Trachea (12 cm long)

Trachea divides at Thoracic-5

Larynx 4-6 (Bladder-Syrinx).

Tracheal bronchi - Pseudostratified columnar ciliated epithelium.

Left lung (2 lobes)

Right lung (3 lobes)

Diaphragm - Dome-shaped

Pulmonary ventilation - 12-16 time/min

Vol. of air measured by - Spirometer

Alveoli - Thin squamous epithelium

100ml oxygenated blood - 5ml O₂.

100ml Deoxygenated blood - 4ml CO₂.

Solubility CO₂ 20-25 times than O₂

thickness less than millimetre (2mm).

Solubility CO - 200-250 for O₂.

- + Planaria (dugesia)
- + Liver fluke (Fasciola hepatica)
- + Jaenia (Tapeworm)

Kidney (T12-L3)

- (each). 10-12 cm Length
- 5-7 cm width
- 2-3 cm thickness.
- 120-170 gm

Nephron 10 lakh (each Kidney) = 20 lakh total.

+ cortical - 80-85%

+ Juxtamedullary - 15-20%

Henle loop - hair pin shaped

Vasa recta - U shaped.

1100-1200 ml blood both kidney/min.

Net filtration pressure (Filter) 8-10 mm hg

GFR - 125 ml/min

PCT - Simple cuboidal brush border epithelium

Urine 4 times concentrated than initial filtrate.

25-30 gm Urea excrete/day

17-30 mg/100 ml in blood.

Urine pH (6.0)

CO₂ 200 ml/min. (by lungs)

H₂O 400 ml/day

Accumulation of Urea in blood - Uremia

Presence of glucose in urine - glycosuria

Presence of Ketone bodies in urine - Ketonuria

* HUMAN REPRODUCTION -

- Testis - oval in shape
 4 to 5 cm length
 2 to 3 cm width.
 Scrotum (2-2.5°C low temp. than body)
 - each testis - 250 compartment (testicular lobules)
 - 1 to 3 highly coiled (Seminiferous tubule)
 3 coverings - Junica vaginalis, Junica Albuginea, Junica Vasculosa

- Penis - ext. genitalia
 3 tissue erectile
 - two dorsally placed - corpora cavernosa
 - one ventrally placed - corpora spongiosa (urethra runs)

- Glands
 • Seminal vesicle - paired, homologous to uterus. 60% contribution (Fructose, Prostaglandin, Fibrinogen)
 • Prostate - 30% contribution (Calcium, enzymes) (unpaired)
 • Bulbo-urethral gland - lubrication & neutralize acidity of urethra.

- Ovary - 2 to 4 cm length
- Fallopian tube - 12 cm (infundibulum ampulla, isthmus)
Funnel shaped

- Uterus - womb
 • inverted pear shaped
- Labia majora (homologous to scrotum)
- Clitoris (homologous to corpora cavernosa)
- Bartholin gland (homologous to Cowper's gland)
- 15-20 mammary lobes.

- Cells of Alveoli → Lumen → m. tubule → m. duct → m. ampulla → Lactiferous duct.
- Ejaculation - 200-300 million sperm
 For normal fertility, 60% normal shape & size & 40% vigorous motility

- Semen vol. (2 to 5 ml) / Ejaculation
- Sperm count 60-150 million/ml
- Meiosis - 4th day
- Implantation - starts 7th day, complete 10/11th day

- Oogenesis
 One month - embryo heart.
 2nd month - Limbs & digits (as human)
 First trimester - Limbs & external genital form.
 5th month - first movement & hair
 2nd trimester - eyelids separate
 9 months - fully developed.

Family planning - 1951
 RCH - Reproductive and child health care.

• Population -

	1900	2000	2011
World -	2 billion	6 billion	7.2 billion
India (1947)	350 million	1 billion	1.2 billion

↓
 May 2021 - 1.38 billion

- Reason for Populating with :-
 (i) decline in death rate
 (ii) MMR (maternal mortality Rate) ↓
 (iii) IMR (Infant mortality Rate) ↓
 - as well as ↑ in no. of people of Reproducible age.

- Saheli - CDRI, Lucknow.
- Populn growth rate -
 2011 - less than 2%, $\frac{20}{1000}$ / year
 2001 - 1.7%, $\frac{17}{1000}$ / year
 2021 - 0.97%

- Ideal contraceptive should be -
 User friendly, easily available, effective, reversible, least side effects. [LEERU]

- IUDs -
 • Non medicated - Lipped Loop
 • Copper releasing - CuT, Cu7, multiloop 375.
 • Hormone releasing - LNG-20, Progesta best.

- Cautions - suppress sperm motility & fertilizing capacity
- MTP (Medical termination of pregnancy).
 - 45 to 50 millions / year in world.
 (1/5th conceived pregnancy / yr.)

- MTP Legalised in 1971.
- MTP amendment act (2017)
 • First 12 week - opinion of one doctor.
 • Fewer than 24 week - opinion of two doctor.

- IVF - In vitro fertilisation.
- ZIFT - zygote intra Fallopian trans.
- IUT - Intra uterine transfer.
- GIFT - gamete intra Fallopian trans.
- ICSI - Intra cytoplasmic sperm injection.
- AIT - Artificial Insemination.
- IUI - Intra uterine insemination.

* PLANT Physiology :-

Photosynthesis - Physico-chemical process.

∴ Pigments separated by Paper chromatography

- Joseph Priestley (1733-1804)
 - 1770 (series of experiment)
 - 1774 - discovered O₂
 - Use mint plant.
- Jan Ingenhousz (1730-1799)
 - Sunlight is essential
 - elegant experiment with aquatic plant (hydrilla)
 - bubbles of O₂ on green parts of plant. (Chlorophyll)
- Julius von Sachs (1854)
 - provide evidence for production of glucose
 - green bodies (chloroplast)
- T.W Engelmann (1843-1909)
 - interesting experiment use prism to split light.
 - green alga (Cladophora)
 - aerobic bacteria to detect O₂ in blue & red region
 - first action spectrum.
- Cornelius von Niel (1897-1985) (microbiologist) - milestone contribution
 - study of purple and green sulphur bacteria.
 - green plant (H₂O) hydrogen donor
 - purple & green sulphur bacteria (H₂S) hydrogen donor.
 - O₂ by green plant come from H₂O not by CO₂.

- Pigments (Universal)**
- chl a - bright or blue green (3:1)
 - chl b - yellow green
 - Xanthophyll - yellow (1:1)
 - carotenoid - yellow to yellow orange
- (chl a : b) = chl & carot enoid (3:1)
- carotenoid : Xanthophyll 1:1
- chl a - maxm absorption red (660 NM) and blue (440 NM)
 - minm absorption green (550 NM)
 - Maxm absorption - white composite light / sunlight.
 - PSI (P700 NM)
 - PSII (P680 NM)
 - (1 O₂ molecule required 8 photon, 8e⁻, 2 ATP and 2 NADPH₂)
 - 1 NADP required (2e⁻ & 2H⁺)
 - 1 ATP formⁿ required 4H⁺.
 - chemiosmosis requires - membrane, proton pump, proton gradient & ATP synthase.
- Photosynthesis (Thylakoid) / Respiration (Intermembrane)
- MALVIN CALVIN ← half life = 5770 yr.
- Use radioactive C¹⁴ in algae (green) chloroplast & Sinedesmus = first CO₂ Fixn product (3PGA)

∴ Proved by tracer / radioactive technique (O¹⁸ isotope) Ruben and Kaumen

- O₂ as by product come from CO₂
- O₂ release in photosynthesis come from H₂O.
- Reducing Power NadPH⁺ + H⁺
- Assimilatory Power ATP & NADPH₂
- Photosynthesis (Robert Hill) - 2 scheme
 - + Light rxn / Photochemical rxn
 - + dark rxn / carbon rxn
 - (stroma) = glucose.
 - (grana lamella PSII & PSI)
 - stroma lamella PSI only

- C₃ plant / pathway - 1st stable product of CO₂ (only mesophyll cell) Fixn is 3-PGA & acceptor (RUBP 5C) ketose sugar
- C₄ plant / pathway - 1st stable product of CO₂ (eg sugarcane, maize, sorghum) Fixn is 4-OAA & 1st acceptor (3C) PEP (phospho enol pyruvate) (both mesophyll & B. sheath cell)
- For glucose formⁿ - only calvin cycle in any plant
- In C₃ cycle - 1 glucose required **18 ATP** & **12 NADPH₂**.
 - For 1 CO₂ - 3 ATP & 2 NADPH₂.
 - (12 in Reduc) (6 in regener of RUBP)
- In C₄ cycle - 1 glucose required **30 ATP** & **12 NADPH₂**.
 - For 1 CO₂ - 5 ATP & 2 NADPH₂.
 - (18 in calvin cycle) (12 in regener of PEP)
- Photorespirath - 1 molecule of (3PGA) & 1 molecule of 2-C Phosphoglycolate. (only in C₃ plants)

External Factors -
Light - at low light, (Linear relat ionshi p) b/w incident light & CO₂ fixath rate.

• Light saturath point 10% of full sunlight. (beyond it photo oxidath occurs) Light is rare limitng factor. (except shady plants, hydrophytes & cloudy days)

Factors :-

Internal / plant - no., size, age, orientath of leaves, mesophyll cells, chloroplasts, internal CO₂ conc., amount of chlorophyll depends on - genetic predisposition and growth of plants.

(All factors work simultaneously)