FREE NOTES · NCERT + NEET LEVEL

Breathing & Exchange of Gases

Respiratory organs, human respiratory system, saans lene ka mechanism, respiratory volumes aur capacities, gases ka exchange aur transport, regulation aur bimariyan.

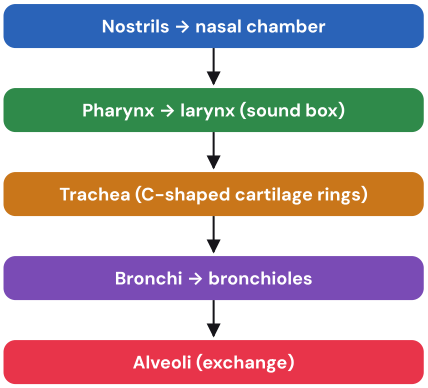
01 Respiratory organs
02 Human respiratory system
03 Saans lene ka mechanism
04 Respiratory volumes aur capacities
05 Gases ka exchange aur transport
06 Regulation aur bimariyan
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11 Quick revision

01 Respiratory organs

- Body surface se seedha diffusion: sponges, coelenterates, flatworms. Geeli cuticle: kenchua. **Tracheal tubes**: insects. **Gills**: zyada tar paani wale arthropods, molluscs, machhliyan. **Lungs**: zameeni (pulmonary). Amphibians (frog) geeli skin se bhi (cutaneous).

02 Human respiratory system

- Larynx = cartilage wala sound box; **epiglottis** (elastic cartilage ka flap) khana larynx me jaane se rokta.
- Trachea 5th thoracic vertebra pe right aur left bronchi me bant-ti; trachea se bronchioles tak adhoore cartilage rings.
- **Alveoli**: patli deewar, khoon ki naliyon wali thailiyan; exchange yahin. Lungs pe do parat wali **pleura**, pleural fluid (ragad kam).
- Conducting part (nostrils se terminal bronchioles: hawa saaf, garam, nam) aur exchange part (alveoli aur ducts).
- Thoracic chamber: peeche vertebral column, aage sternum, side me ribs, neeche gumbad jaisa **diaphragm**; hawa-band.



Hawa ka raasta

03 Saans lene ka mechanism

Step	Inspiration (active)	Expiration (aam taur pe passive)
Diaphragm	Sikudta, chapta	Dheela, gumbad
External intercostal muscles	Sikudte: ribs aur sternum upar	Dheele
Thoracic volume	Badhta	Ghatta
Intra-pulmonary pressure	Atmosphere se kam ⇒ hawa andar	Atmosphere se zyada ⇒ hawa bahar

Abdominal muscles saans ki taakat badhate. Swasth insaan: 12–16 saans per minute; **spirometer** se maap.

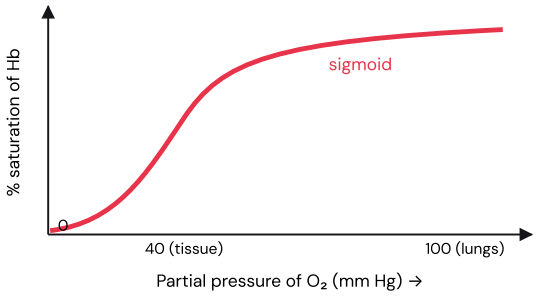
04 Respiratory volumes aur capacities

Term	Meaning	Value
Tidal volume (TV)	Air in/out in normal breath	~500 mL (6000–8000 mL/min)
IRV	Extra air inspired forcibly	2500–3000 mL
ERV	Extra air expired forcibly	1000–1100 mL
Residual volume (RV)	Air left after forcible expiration	1100–1200 mL
Inspiratory capacity	TV + IRV	
Expiratory capacity	TV + ERV	
FRC	ERV + RV	
Vital capacity (VC)	ERV + TV + IRV (max after forced inspiration)	
Total lung capacity	VC + RV	

05 Gases ka exchange aur transport

mm Hg	Air	Alveoli	Deoxy blood	Oxy blood	Tissues
pO_2	159	104	40	95	40
pCO_2	0.3	40	45	40	45

- CO_2 ki ghulnsheelta O_2 se 20–25 guna. Diffusion membrane: alveolar squamous epithelium + basement membrane + capillary endothelium (kul 1 mm se kam).
- O_2: ~97% RBC me oxyhaemoglobin, 3% plasma me. Har Hb 4 O_2 tak. Har 100 mL oxygenated blood tissues ko ~5 mL O_2.
- CO_2: 20–25% carbamino-haemoglobin, ~70% bicarbonate (carbonic anhydrase), ~7% ghula. 100 mL deoxygenated blood alveoli ko ~4 mL CO_2.
- Kam pO_2, zyada pCO_2, zyada H^+, zyada temperature (tissues) O_2 chhodne me madad: curve daayein.



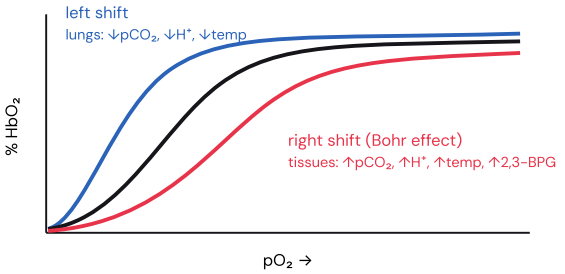
Oxygen dissociation curve

06 Regulation aur bimariyan

- Medulla me **respiratory rhythm centre**; pons ka **pneumotaxic centre** use control karta (inspiration chhota, rate zyada). Paas ka chemosensitive area CO_2 aur H^+ pe react. Aortic arch aur carotid artery me receptors. O_2 ka role kam.
- **Asthma**: bronchi/bronchioles me sujan, ghargharahat. **Emphysema**: alveolar walls kharab, surface area kam; cigarette mukhya kaaran. **Occupational disorders**: pathar todne/ghisne me dhool ⇒ fibrosis; mask zaroori.

07 Extra + tricks

- **Bohr effect**: zyada pCO_2 / H^+ se Hb ki O_2 pakad kam ⇒ tissues me O_2 chhoot-ti (right shift).
- **Haldane effect**: lungs me Hb pe O_2 judne se CO_2 (aur H^+) chhoot-ta.
- **Chloride shift** (Hamburger phenomenon): HCO_3^- RBC se plasma me; balance ke liye Cl^- RBC me.
- Respiratory organs: skin (kenchua, mendhak), tracheae (insects), book lungs (bichhu, makdi), book gills (*Limulus*), gills (machhli, crustaceans), ctenidia (molluscs), lungs (reptiles, birds, mammals).
- Capacities ka trick: har **capacity** = do ya zyada **volumes** ka jod.



O_2 dissociation curve ke shifts

08 Important Q&A

Q1. Expiration aam taur pe passive kyun?

Diaphragm aur intercostal muscles dheele hone se volume ghatta; shaant saans me sikudne ki zaroorat nahi.

Q2. TV 500, IRV 2500, ERV 1000 mL ho to vital capacity?

VC = 500 + 2500 + 1000 = 4000 mL.

Q3. Zyada tar CO_2 kis roop me?

Bicarbonate (~70%), RBC me carbonic anhydrase se.

09 Common mistakes

- Residual volume ko vital capacity me jodna.
- Kehna ki O_2 saans control karta (CO_2 aur H^+ karte).
- Alveoli ka pO_2 159 likhna (wo hawa ka; alveoli 104).
- Trachea rings ko poore gol sochna (C-shape).

10 Practice (NEET style)

1. Respiratory rhythm control karne wala centre?
2. Tidal volume kitna?
3. Bicarbonate banane wala enzyme?
4. Alveolar walls kharab hone ki bimari?
5. Tissues me pO_2?

ANSWERS

1) Pneumotaxic (pons) · 2) 500 mL · 3) Carbonic anhydrase · 4) Emphysema · 5) 40 mm Hg

11 Quick revision: exam se 5 minute pehle

BREATHING

- Inspiration: diaphragm sikudta
- Pressure atmosphere se kam

VOLUMES

- TV 500, IRV 2500–3000
- ERV 1000–1100, RV 1100–1200
- VC = TV+IRV+ERV

TRANSPORT

- O_2 97% HbO_2
- CO_2 70% bicarbonate
- Curve sigmoid

CONTROL/DISORDERS

- Medulla rhythm, pons pneumotaxic
- Asthma, emphysema

Koi doubt? padhaiadda.netlify.app pe AI Doubt Solver se poocho, ya is chapter ka mock test do.