YAKEEN NEET 2.0

2026

9.7.2025

BREATHING AND EXHANGE OF GASES

ZOOLOGY | Lecture – 6

By- SAMAPTI MAM

Topics to be covered

1. Regulation of respiration , disorders, TAPASYA

PYQs + Q

2.

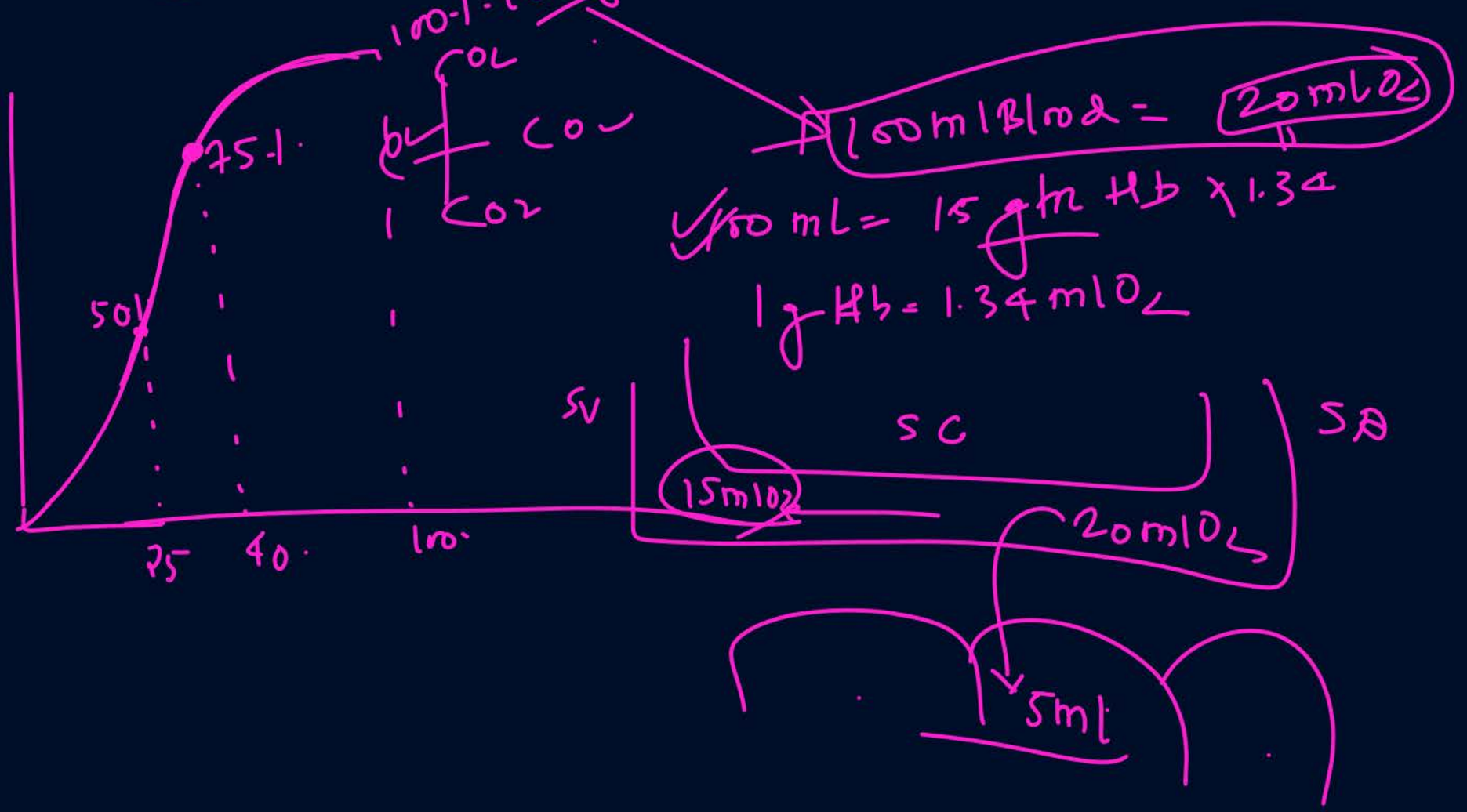
3.

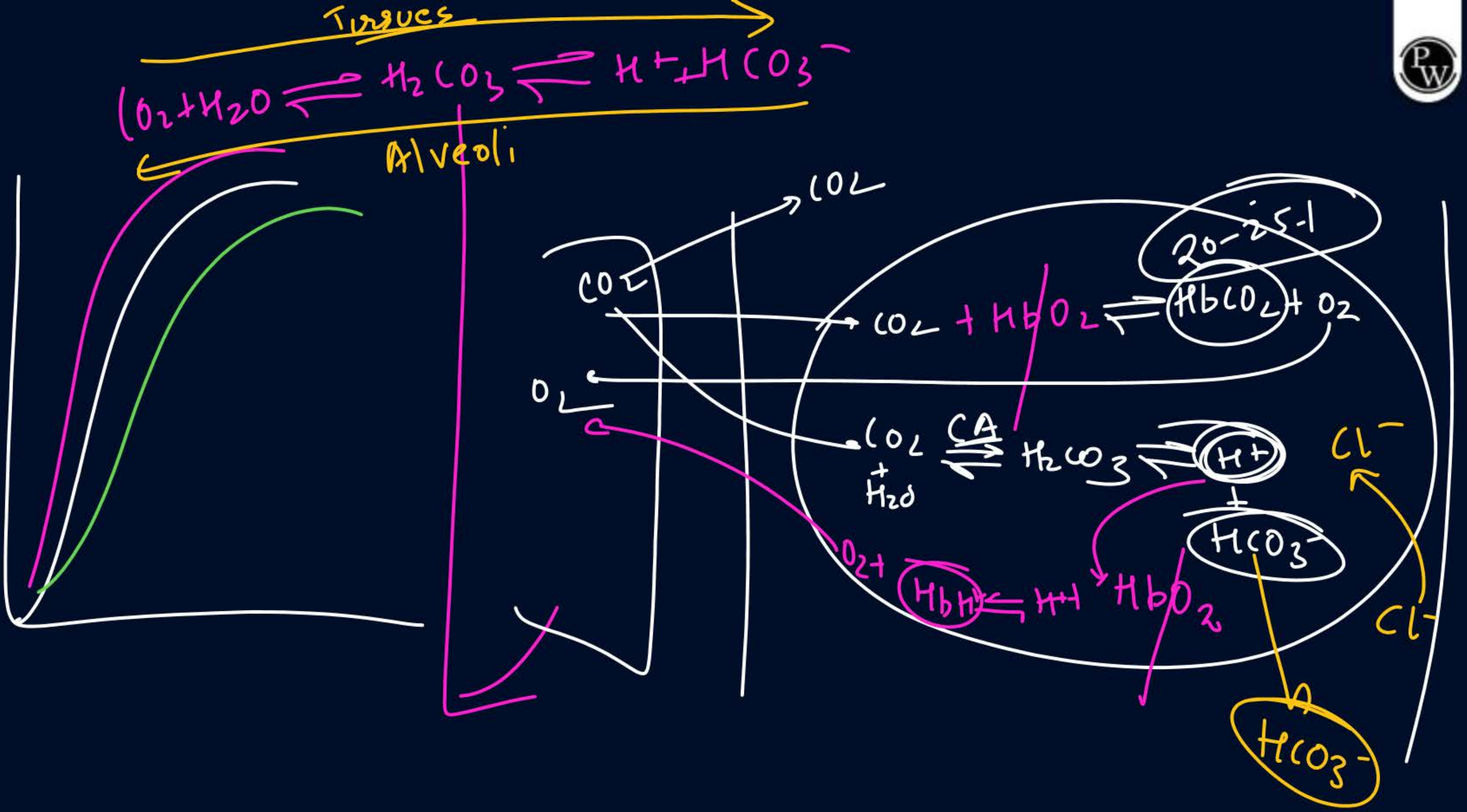
4.

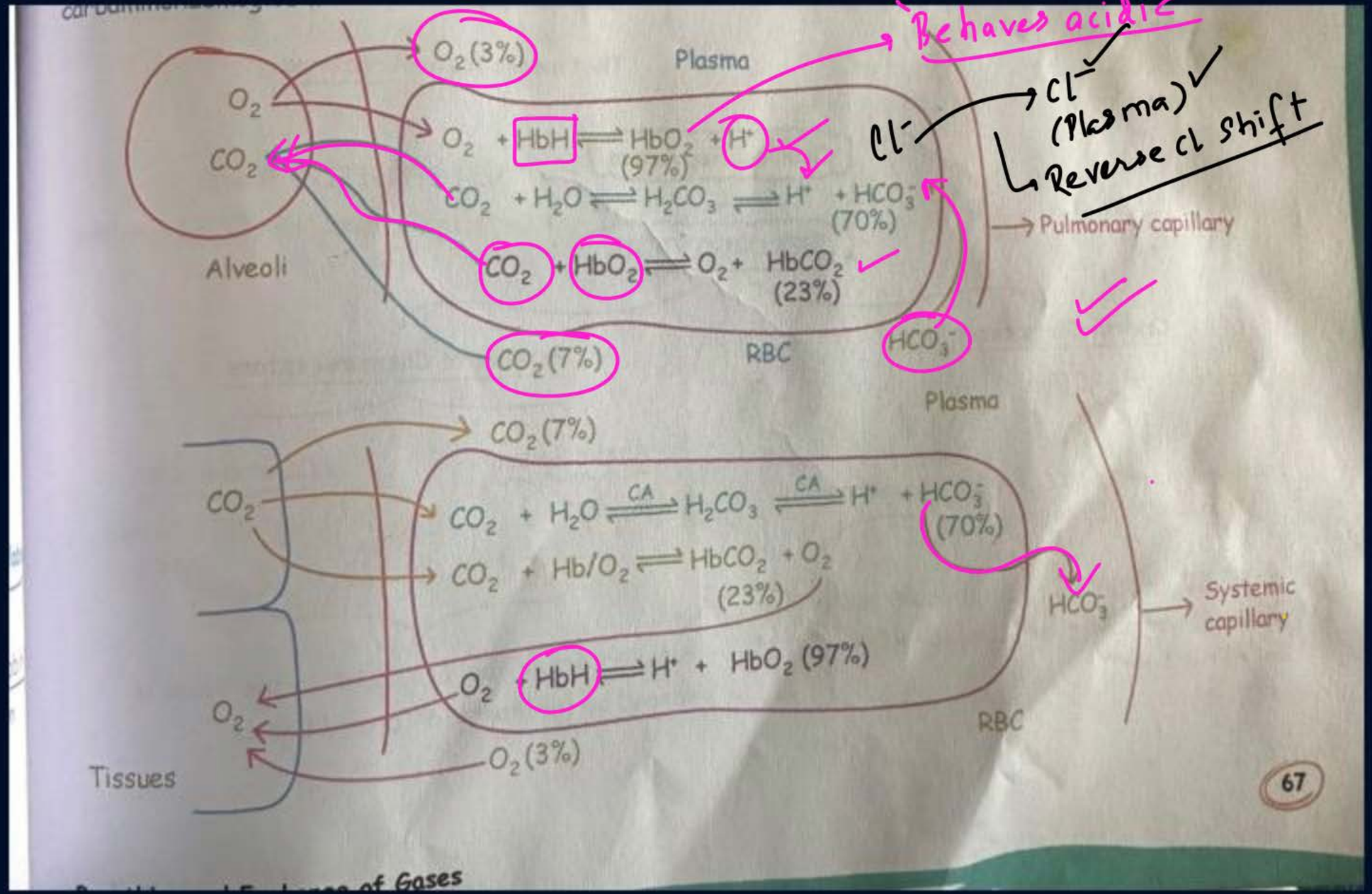
MY TELEGRAM

#2 amphiexpress

Cooperative Binding




Tissues
$CO_2 + H_2O \rightleftharpoons H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$
Alveoli
CO_2
CO_2
O_2
$CO_2 + HbO_2 \rightleftharpoons HbCO_2 + O_2$
20-25-1
$CO_2 + H_2O \xrightleftharpoons{CA} H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$
Cl^-
$O_2 +$
$HbH^+ \rightleftharpoons H^+ + HbO_2$
Cl^-
HCO_3^-


Behaves acidic?
O_2 (3%)
Plasma
O_2
CO_2
O_2 + HbH ⇌ HbO_2 + H^+
(97%)
CO_2 + H_2O ⇌ H_2CO_3 ⇌ H^+ + HCO_3^-
(70%)
Cl^-
Cl^- (Plasma)
Reverse Cl shift
Pulmonary capillary
Alveoli
CO_2 + HbO_2 ⇌ O_2 + $HbCO_2$
(23%)
CO_2 (7%)
RBC
HCO_3^-
Plasma
CO_2 (7%)
CO_2
CO_2 + H_2O ⇌ H_2CO_3 ⇌ H^+ + HCO_3^-
CA CA
(70%)
CO_2 + Hb/O_2 ⇌ $HbCO_2$ + O_2
(23%)
HCO_3^-
Systemic capillary
O_2 + HbH ⇌ H^+ + HbO_2 (97%)
O_2
RBC
O_2 (3%)
Tissues
67

Regulation of Respiration:

① Nervous Regulation

- (a) By RRC
  - Respiratory Rhythm Centre
- (b) By PC
  - Pneumotaxic Centre

② Chemical Regulation

- (a) By Central Chemoreceptors
- (b) By Peripheral Chemoreceptor

* CHEMORECEPTORS
  'Chemical'
  ↳ Sensitive towards change in concentration of certain Chemicals.

Nervous Regulation

i) By RRC

- Location: Medulla of Hindbrain
- Controls Normal, forceful Breathing: maintains Rhythm of Breathing

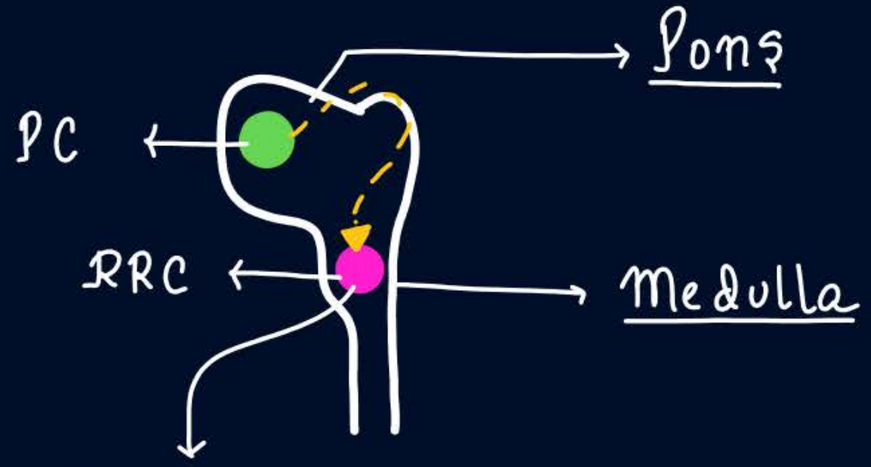
* I = 2s, E = 3s] 5s

(ii) By PC

- Location: Pons of Hind Brain.
- Can moderate the functions RRC by signalling it
- Also K/a 'SWITCH' OFF Centre.
- Signals from PC can Reduce the duration of inhalation

⇓

'BREATHING RATE FASTER'



Neurons can signal 'Diaphragm', ICM to Regulate Respiration

Chemical Regulation

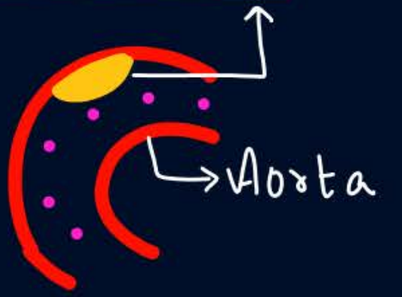
① Central Chemoreceptors

- Location: MEDULLA
- A Chemosensitive area located adjacent to RRC is sensitive to change in conc. of 'CO_2 & H^+' in CSF : Cerebro-spinal fluid

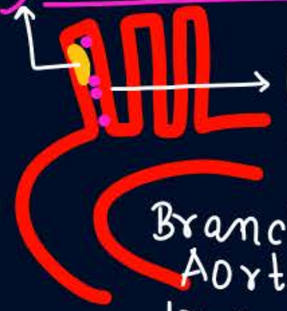
↑ in 'CO_2 & H^+' can cause these to send signal to RRC

② Peripheral Chemoreceptor

i) Aortic Bodies



ii) Carotid Bodies



Branch of Aorta: supply O_2 Blood to Brain

- ↑ in conc. of 'CO_2 & H^+' in Blood

Causes these receptors to send signal to RRC

Breathing RATE ↑

NOTE The role of O_2 in regulation of respiration is quite insignificant.

14.5 Regulation of Respiration

Human beings have a significant ability to maintain and moderate the respiratory rhythm to suit the demands of the body tissues. This is done by the neural system. A specialised centre present in the medulla region of the brain called respiratory rhythm centre is primarily responsible for this regulation. Another centre present in the pons region of the brain called pneumotaxic centre can moderate the functions of the respiratory rhythm centre. Neural signal from this centre can reduce the duration of inspiration and thereby alter the respiratory rate. A chemosensitive area is situated adjacent to the rhythm centre which is highly sensitive to CO_2 and hydrogen ions. Increase in these substances can activate this centre, which in turn can signal the rhythm centre to make necessary adjustments in the respiratory process by which these substances can be eliminated. Receptors associated with aortic arch and carotid artery also can recognise changes in CO_2 and H^+ concentration and send necessary signals to the rhythm centre for remedial actions. The role of oxygen in the regulation of respiratory rhythm is quite insignificant.

Disorders:

1) **Asthma**: It is an 'Allergic disorder' in which there is an 'inflammation' in the wall of 'Bronchi & Bronchioles'

- **Inflammation**: Redness, Swelling, Warm.
- Here excessive mucus secreted, spasm (prolonged Contraction in the wall of Bronchi & Bronchiole)

↓

Narrow air passage: 'Breathing' DIFFICULTY

- 'WHEEZING' SOUND produced.

(Cross section)

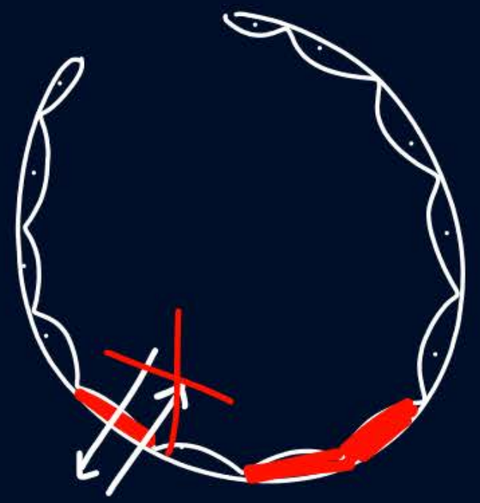
a) Normal 'Bronchi / Bronchiole'

(Air passage narrow)

Fig: 'Asthma'

② EMPHYSEMA: means: FULL of Air

- Its a CHRONIC DISORDER (suffers for a long time), whose one of the major reason is EXCESSIVE CIGARETTE SMOKING.
- ALVEOLAR wall damaged
  - → Elasticity is lost (Elastin Protein damage)
  - → reduced surface area for exchange of gases
    - ↓
    - feels like LUNGS STILL filled with air.



③ Occupational Respiratory Disorder: for people working in Coal / Mine / Cement / Stone Breaking industries & come in contact with pollutants in everyday life

↓

SERIOUS LUNG DAMAGE (fibrosis in upper part of LUNGS)

↓

Should wear protective mask.

- ORD also k/a 'PNEUMOCONIASIS'
- Silicon (Pollutant): Silicosis
- Asbestos (") : Asbestosis.

14.6 Disorders of Respiratory System

Asthma is a difficulty in breathing causing wheezing due to inflammation of bronchi and bronchioles.

Emphysema is a chronic disorder in which alveolar walls are damaged due to which respiratory surface is decreased. One of the major causes of this is cigarette smoking.

Occupational Respiratory Disorders: In certain industries, especially those involving grinding or stone-breaking, so much dust is produced that the defense mechanism of the body cannot fully cope with the situation. Long exposure can give rise to inflammation leading to fibrosis (proliferation of fibrous tissues) and thus causing serious lung damage. Workers in such industries should wear protective masks.

NOTE

1) 'CO' poisoining:

CO + Hb ⟶ HbCO (Carboxyhaemoglobin)

'CO' has 200-250 times more affinity towards 'Hb' than O_2

- CLOSED ROOM: Burning lamp: Incomplete combustion: 'CO' formed: Bind to 'Hb'
  ↓
  Bind to Hb, O_2 can't Bind; eventually O_2 not given to tissue: DEATH may occur.

2) Hypoxia: Less O_2 in tissue.

3) Altitude Sickness:

High Altitude: 'pO_2 low'
↓
Enough O_2 not diffused into Blood
↓
'Hb' not completely saturated
↓
'Hypoxia' seen
(Altitude sickness)

- To Compensate: Body produces more RBC
  ↓
  so that whatever O_2 is available can be utilised maximally to Bind to 'Hb'.

11.20 Catalyst

QUESTION

Assertion (A): At the tissue site, partial pressure of CO_2 is high
Reason (R): Catabolism causes increase in partial pressure of CO_2 at tissues

1. Both Assertion (A) and Reason (R) are the true, and Reason (R) is a correct explanation of Assertion (A).

2. Both Assertion (A) and Reason (R) are the true, but Reason (R) is not a correct explanation of Assertion (A).

3. Assertion (A) is true, and Reason (R) is false.

4. Assertion (A) is false, and Reason (R) is true.

QUESTION

Statement-I: O2 gets bound to haemoglobin in the lung surface due to high pCO2
Statement-II: Every 1000 ml of oxygenated blood can deliver around 5 ml of O2 to the tissues under normal physiological conditions.

1. Statement I and Statement II both are correct.
2. Statement I is correct, but Statement II is incorrect.
3. Statement I is incorrect, but Statement II is correct.
4. Statement I and Statement II both are incorrect.

A large proportion of oxygen remains unused in the human blood even after its uptake by the body tissue. This O_2 :

A. helps in releasing more O_2 to the epithelial tissues

B. is enough to keep oxyhemoglobin saturation at 96%

C. raises the pCO_2 of blood to 75mm of Hg

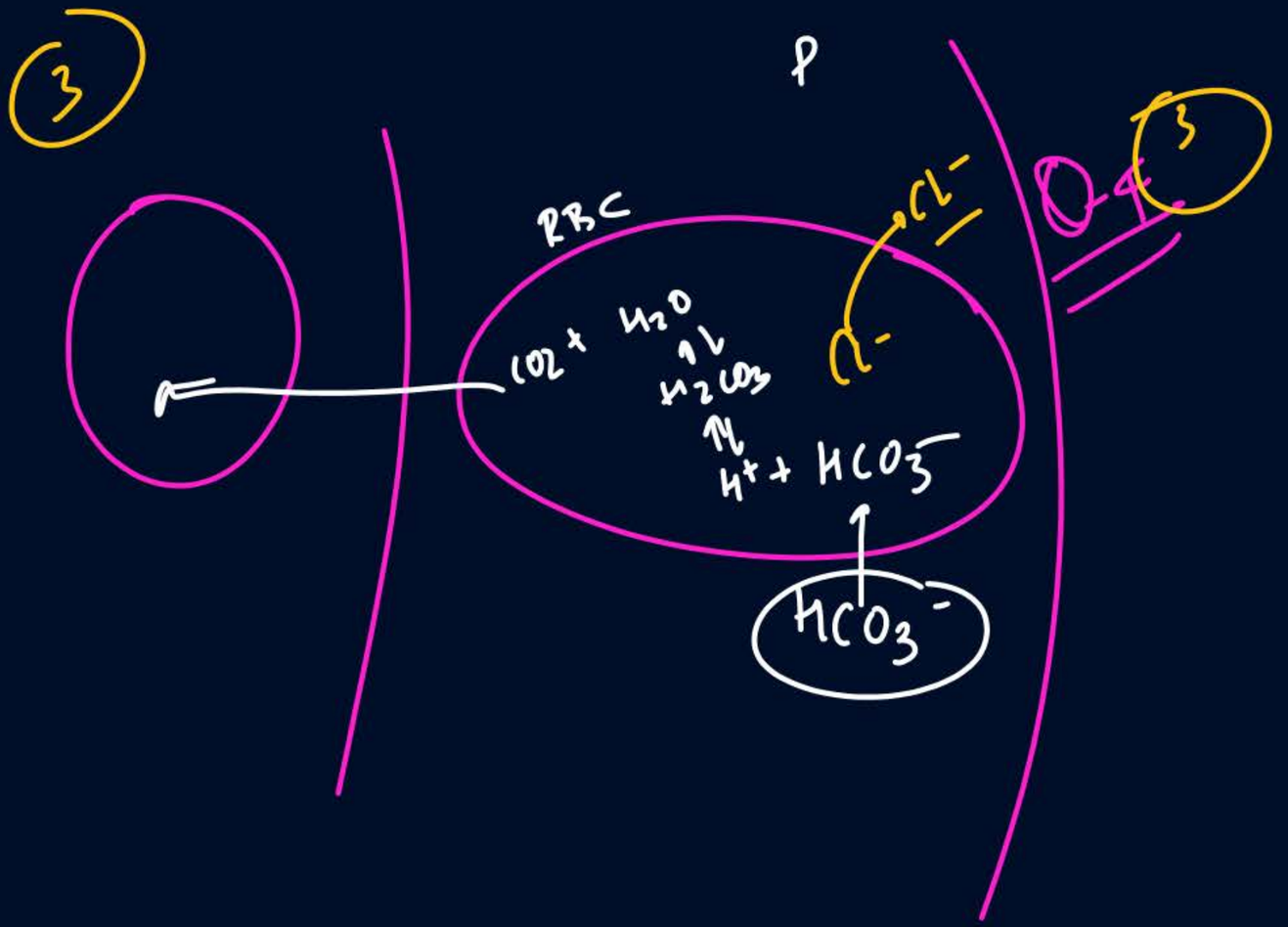
D. acts as a reserve during muscular exercise

Q.3

4

In lungs there is definite exchange of ions between RBC and plasma. Removal of CO_2 from blood involves

(1) Influx of Cl' into RBC
(2) Efflux of Cl' from plasma
(3) Influx of HCO_3' ions in RBC
(4) Efflux of HCO_3 ions from RBC



The oxygen - haemoglobin dissociation curve will show a right shift in case of

(A) High Pco2
(B) High pO2
(C) Low pCO2
(D) Less H+ concentration

Q-5

①

Which statements are true/false"

(i) Blood transports CO2 comparatively easily because of its high solubility
(ii) Approximately 8.9% of CO2 is transported dissolved in plasma
(iii) CO2 diffuses into blood, passes into RBCs and reacts with water to form H2CO3
(iv) Oxyhaemoglobin of erythrocytes is basic
(v) Chloride ions diffuse from plasma into erythrocytes to maintain ionic balance

(1) (i), (iii) and (v) are true, (ii) and (iv) are false
(2) (i), (iii) and (v) are false, (ii) and (iv) are true
(3) (i), (ii) and (iv) are true, (iii) and (v) are false
(4) (i), (ii) and (iv) are false, (iii) and (v) are true

QUESTION

What is the approximate partial pressure of oxygen (pO_2) in systemic arteries?

1. 40 mmHg
2. 45 mmHg
3. 80 mmHg
4. 95 mmHg ✓

Q.7

(4)

QUESTION

In the alveoli, which of the following factors is/are favourable for the formation of oxyhaemoglobin?

I. High pO_2
II. Low pCO_2
III. Lesser H^+ concentration
IV. Lower temperature
V. Low pH

Choose the correct option.

1. Only (I)
2. (I), (II), (III) and (IV)
3. (I), (II) and (III)
4. All of these

Tapasya (PYQ + other)

(a) Recorded + (b) LIVE

Homework

- REVISE CLAASNOTES / ZOOLOGY MED EASY

MODULE HW
Module -1
Prarambh exercise 1- 7-26

Samapti Sinha Mahapatra

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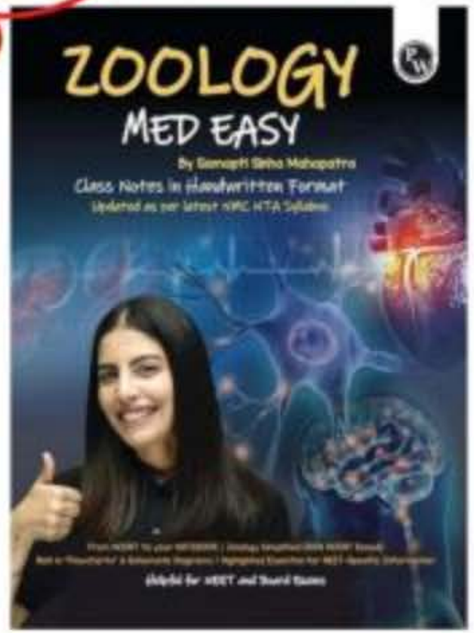

THANK YOU