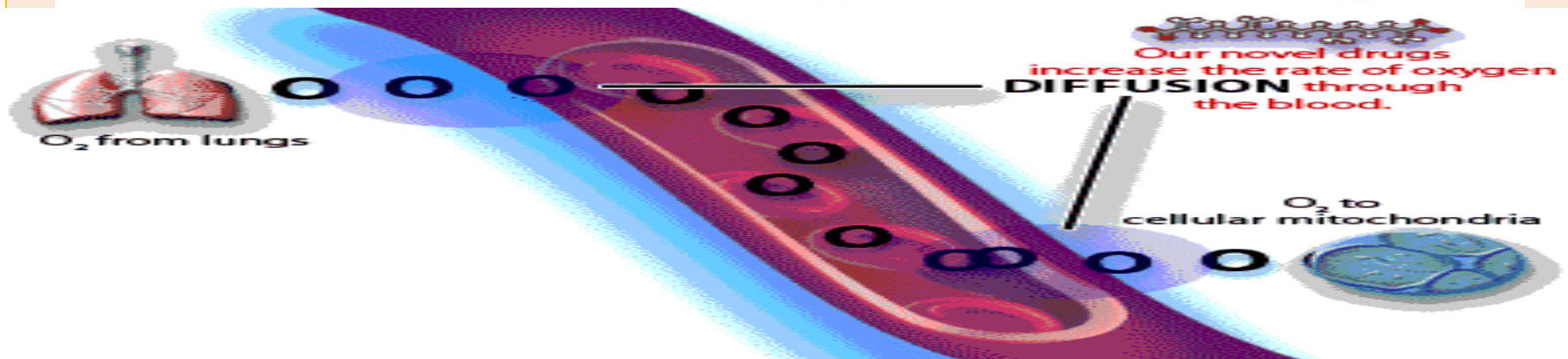


OXYGEN- HEMOGLOBIN DISSOCIATION CURVE



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O₂ TRANSPORT BY BLOOD

Forms of O₂:

gases in chemical form have no pressure

Tissues need (=250 ml/min)

ITMES	<u>A- Physical Solution</u>	<u>B- Chemical combination</u>
Nature	The molecules of O ₂ are dissolved in plasma.	The molecules of O ₂ are in <u>combination with Hb</u>
Value	It about <u>3%</u>	It about <u>97%</u>
O ₂ supply to tissue	10 ml/min.	240 ml/min.
importance	It determines O ₂ pressure, so it determines the direction & rate of diffusion of gas in chemical combination from or to blood.	It is main O ₂ supply to the tissue.

Some Definitions

1- O₂ Content : is the volume of O₂ present in combination with Hb / 100 ml blood.

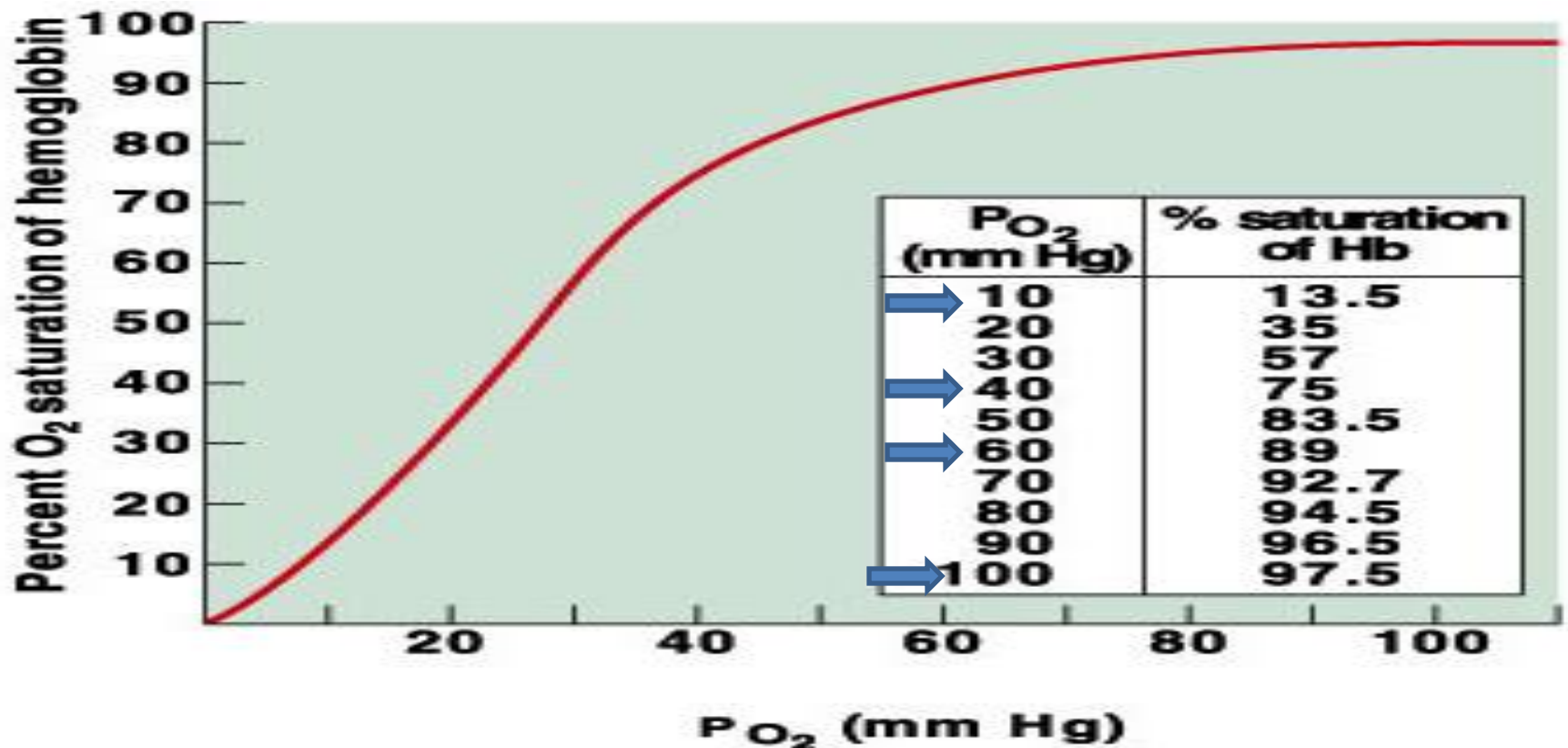
2-O₂ Capacity : is the maximum volume of O₂ present in combination with Hb when the Hb is fully saturation in 100 ml blood. Hb is 15 gm% & each 1 gm can carry 1.33 ml O₂. O₂ capacity = 15 X 1.33 = 20 ml. *(but only 97.5 % of Hb which carried O₂, so it contain 19.5 ml).*

3-O₂ Saturation= $\frac{\text{O}_2 \text{ content}}{\text{O}_2 \text{ capacity}} \times 100 = \frac{19.5}{20} = 97.5 \%$

O₂ Dissociation (Saturation) Curve

●Def.,

It is the relationship between O₂ tension and O₂ saturation in the blood.

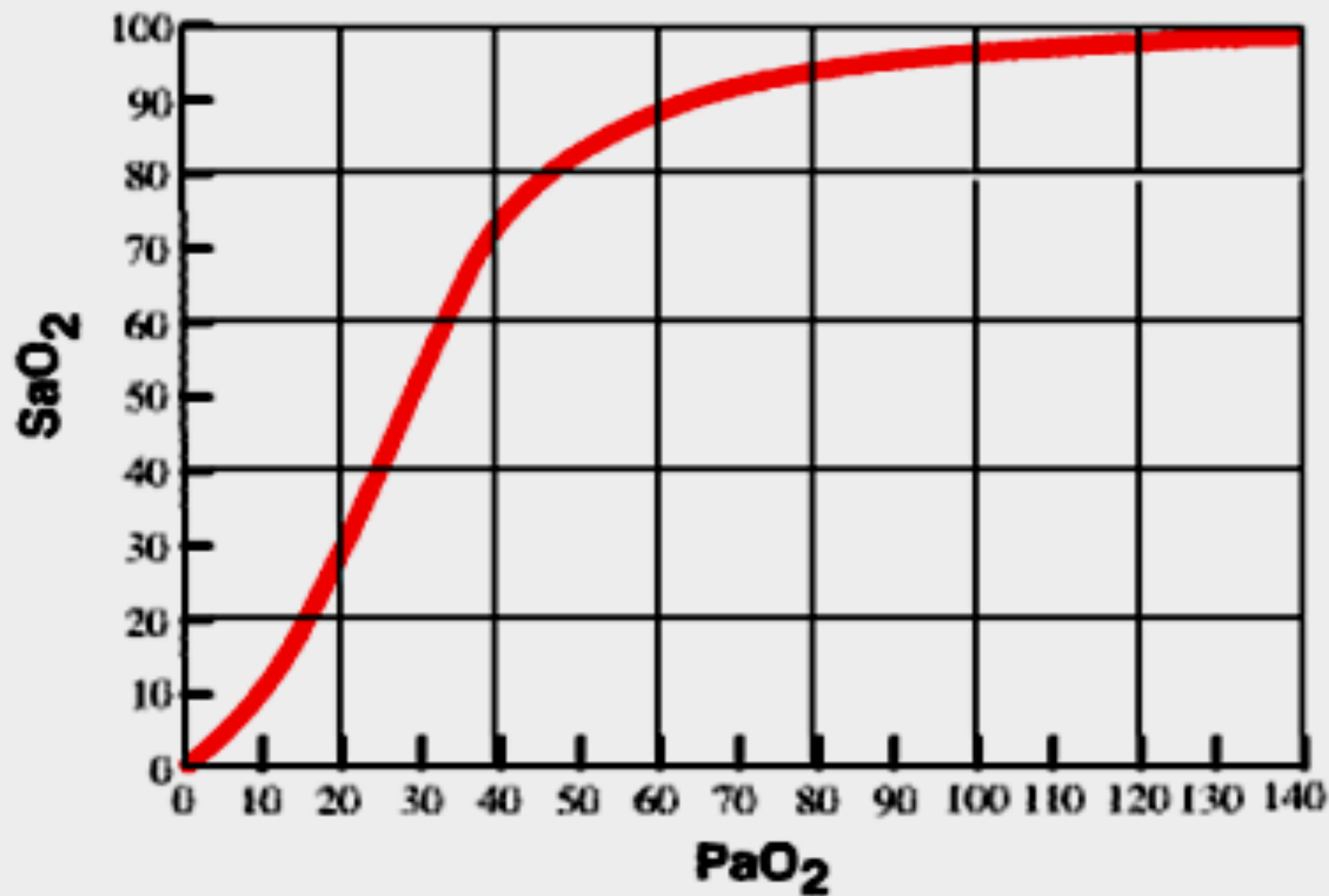


Physiological Significance of the Curve

-The shape of the curve is S-shaped upper segment is horizontal and lower segment is vertical.

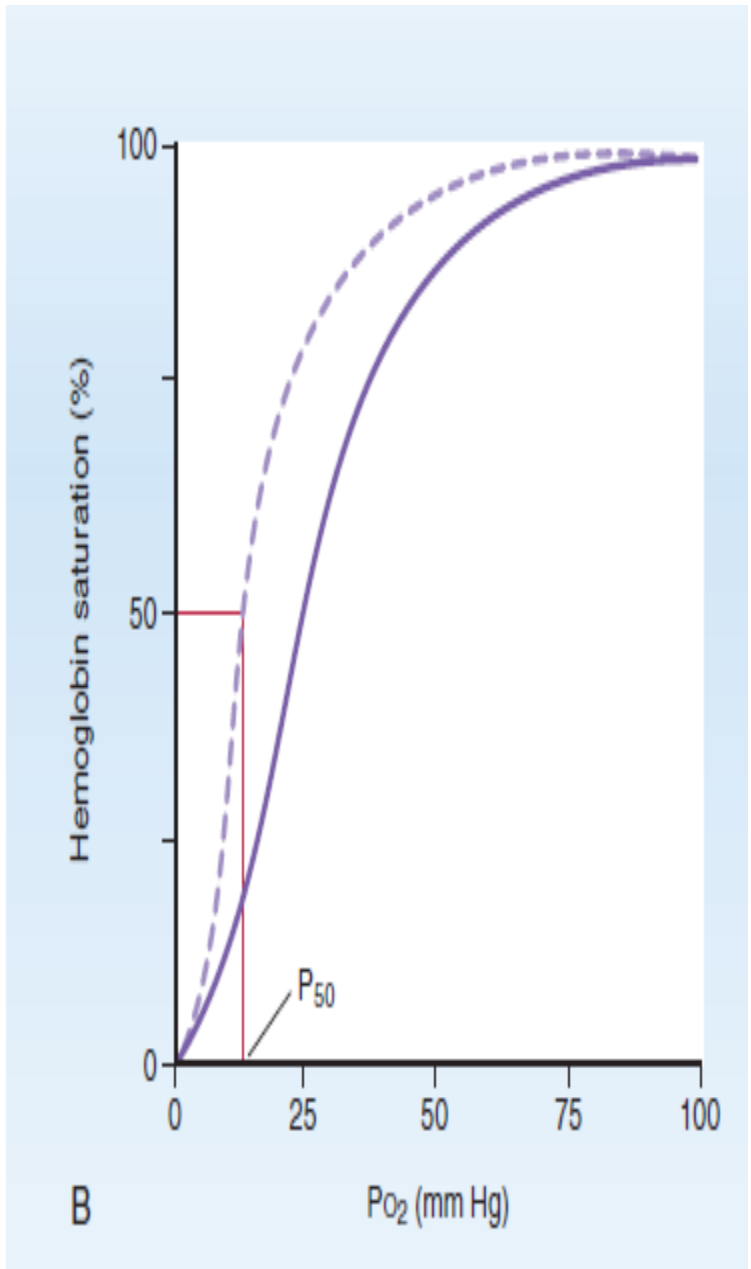
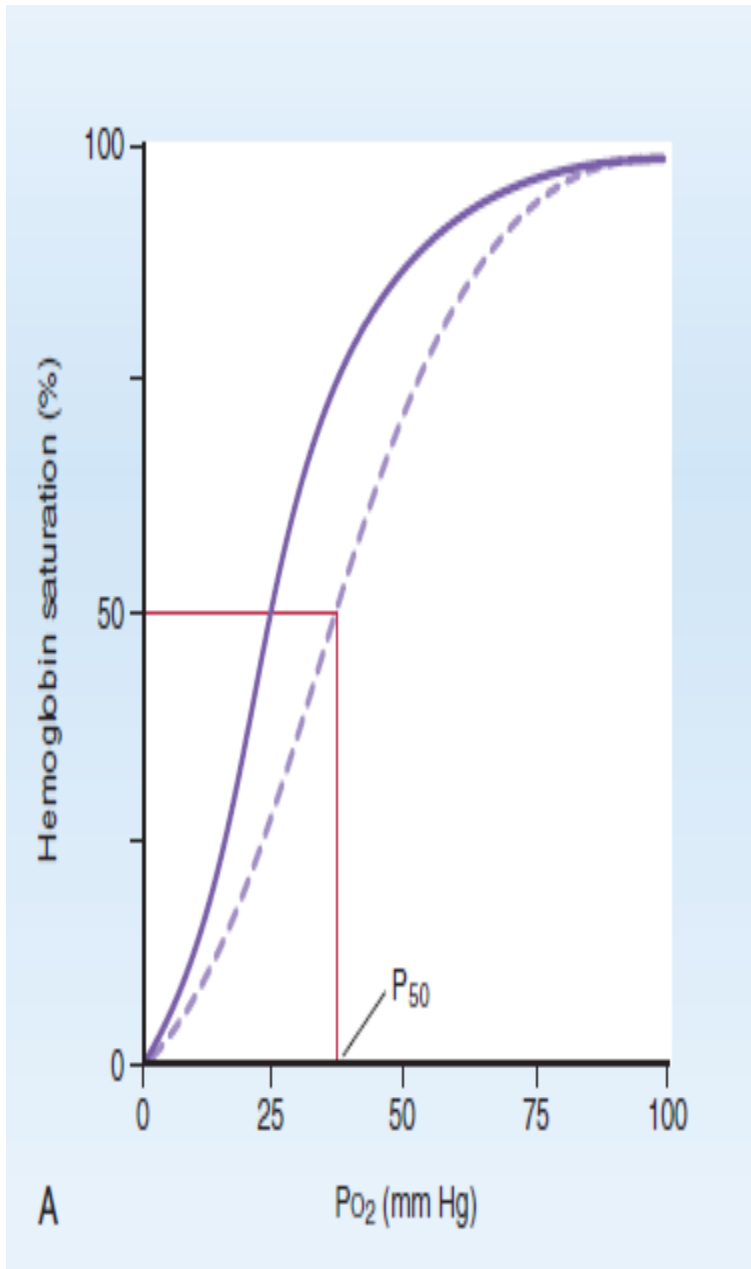
- Upper segment is horizontal these means that O_2 tension can be reduced to about 60 mmHg while the O_2 saturation is decreased to 90%, this means that Hb can be still saturated even at lower O_2 tension as at high altitudes and in excessive lung diseases. (horizontal= high tension= high affinity)
- Lower segment is vertical this means that slight decrease in O_2 tension is accompanied by marked decrease in O_2 saturation. (lower segment = low tension = low affinity)

OxyHemoglobin Dissociation Curve



N.B:

-P50 refers to partial pressure of O_2 at 50% saturation of Hb with O_2 . An index of the position of the Hb- O_2 dissociation curve is given by the P_{50} (average), the PO_2 (25 mmHg).



● Factors that Shift the Curve

Shift to Right

- ↑↑ levels of CO₂ (as in muscular exercise).
- ↑↑ H⁺ (as in diabetes mellitus).
- ↑↑ 2,3-diphosphoglycerate (2,3-DPG) (as in exercise).

Because CO₂, H⁺ and 2,3-DPG combined with Hb so decrease affinity of Hb to O₂

- ↑↑ temperature (as in fever).
 - ↑↑ Hb concentration (as in polycythemia).
- ##All these factors are present in the active tissue*

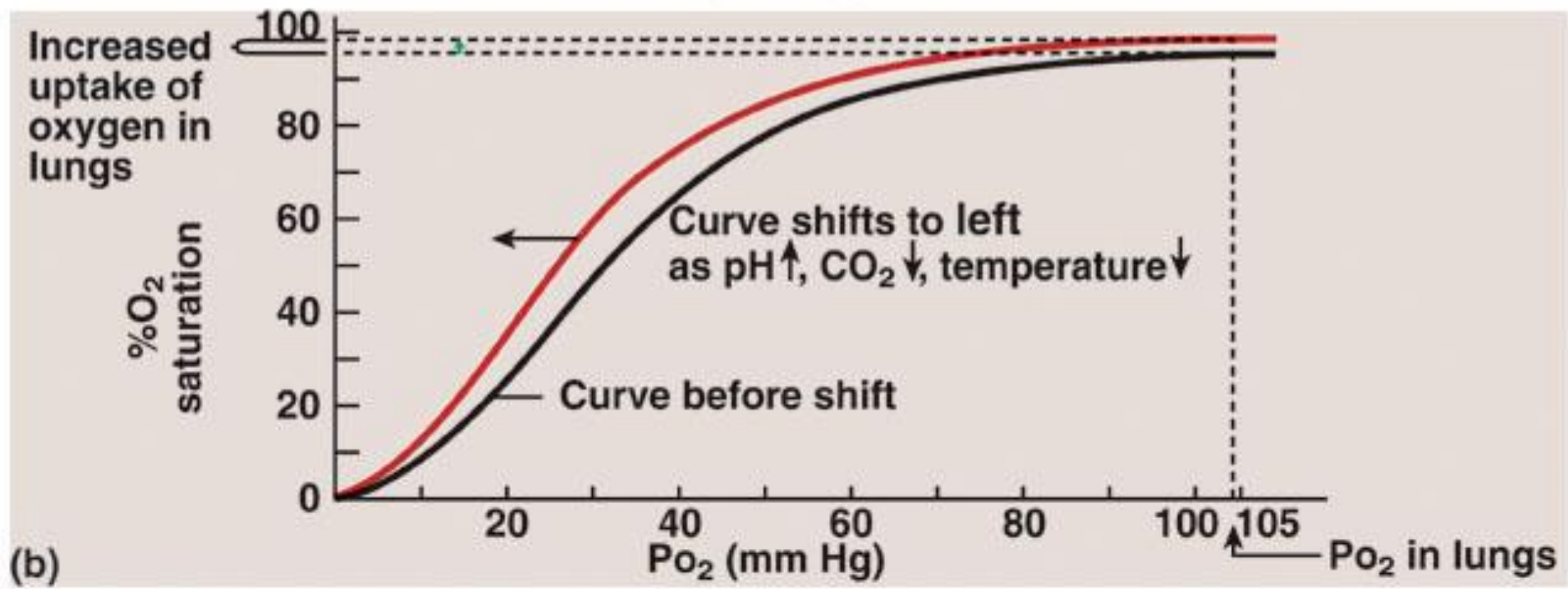
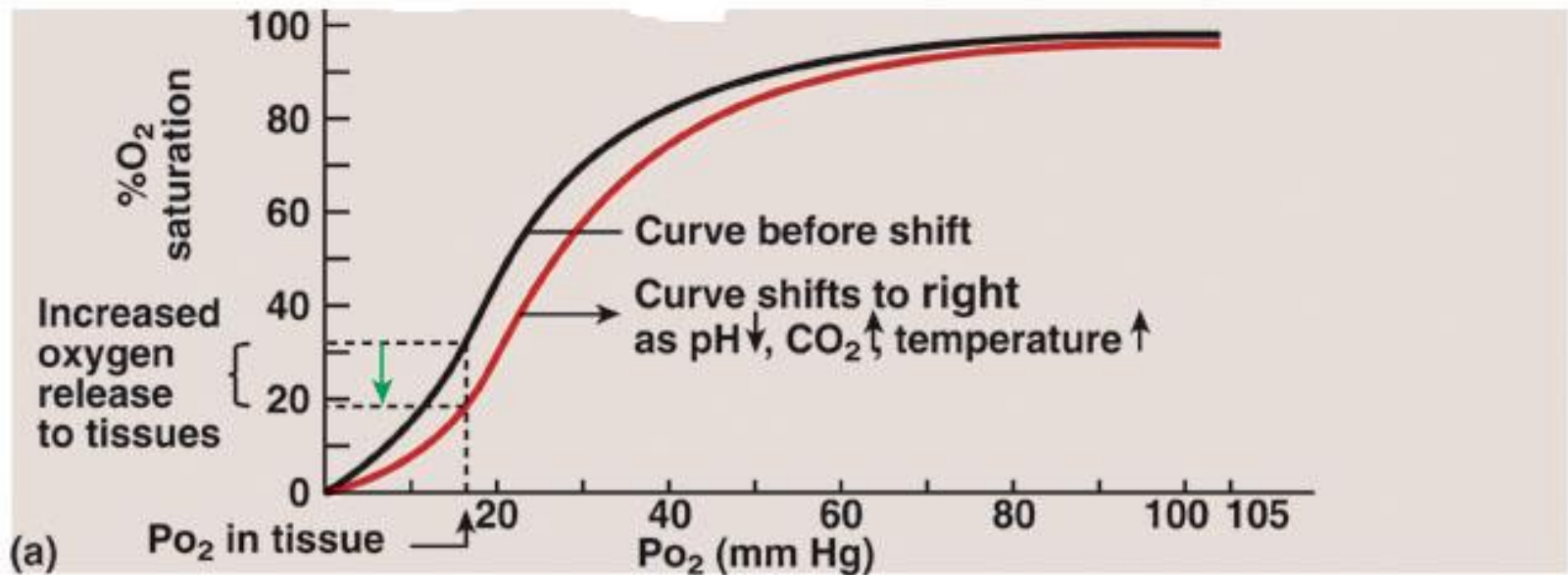
Shift to right means that the affinity of Hb to O₂ is decreased. So it give O₂ easily to tissues (more O₂ supply). **Right**: causes **R**elease of O₂.

Shift to Left

- ↓↓ levels of CO₂ (as in during sleep).
- ↓↓ H⁺ (as in high altitude).
- ↓↓ 2,3-diphosphoglycerate (as in acidosis and stored blood).

- ↓↓ temperature (as in hypothermia and during sleep).
 - ↓↓ Hb concentration (as in anemia)
- ##All these factors are present in the inactive tissue*

Shift to left means that the affinity of Hb to O₂ is increased. So **L**eft shift: causes **L**oading of O₂ in **L**ungs.



● Significance of the Shift

1-The Boher's Effect:

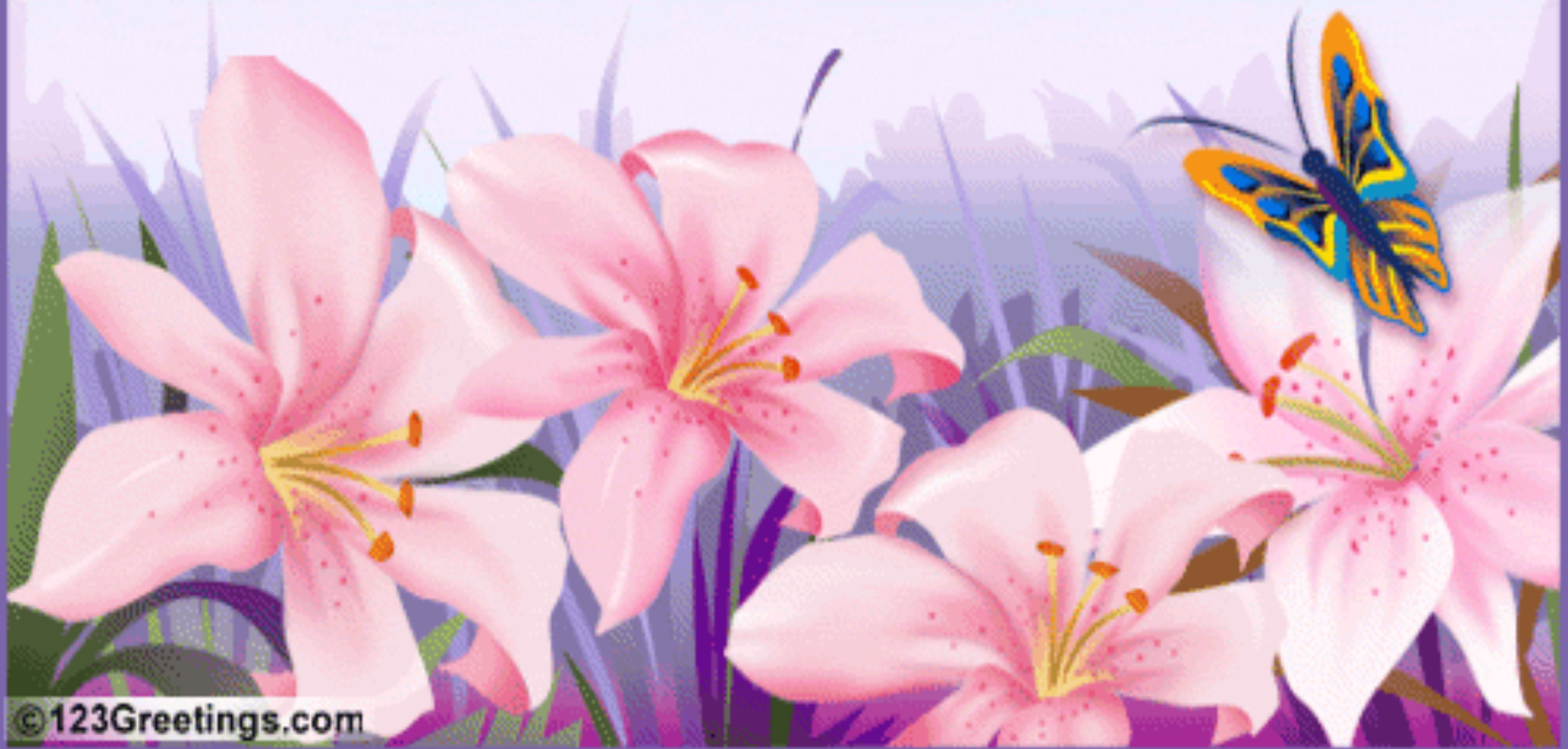
Def., Increase of CO_2 (or H^+) leads to decrease affinity of Hb to O_2 so it give its O_2 easily to tissues and visa versa.

Importance: As blood pass through the lung, CO_2 diffuse from blood to alveoli this decrease the CO_2 level and increase O_2 loading to Hb.

-Then blood reach tissues, the CO_2 diffuse from tissues to blood this increase the CO_2 level and increase O_2 removal from Hb more O_2 free and more O_2 supply to tissues.

2- The Exercise: With muscular exercise, there are CO_2 , H^+ , 2,3-DPG & temperature these lead to increase O_2 removal from Hb, more O_2 free and more O_2 supply to tissues.

*Just to say...
Goodbye & good luck for the future!*



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