Pulse Oximeter

14BM16

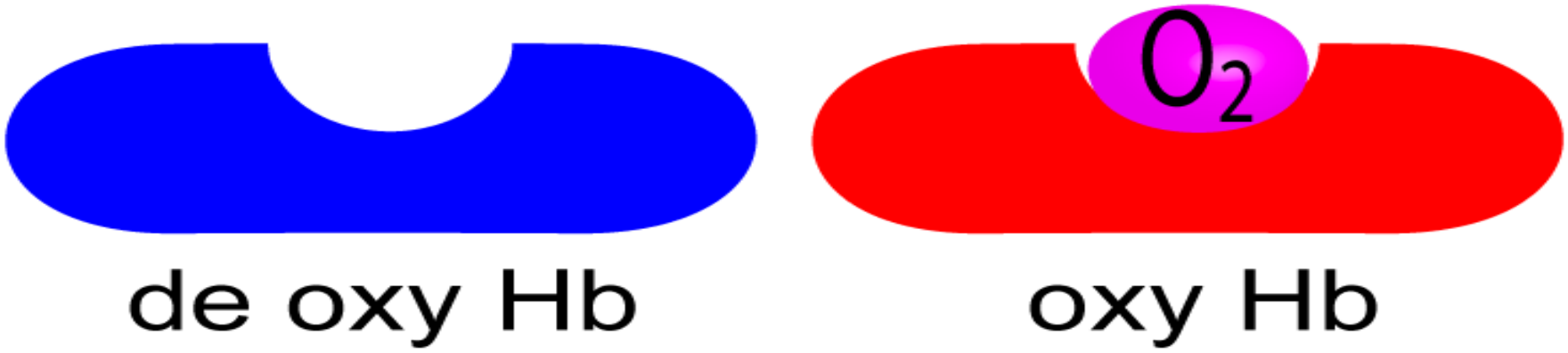
Pulse Oximeter:

Pulse Oximeter used to measure oxygen saturation in the body i.e how much of the hemoglobin in the blood is carrying the oxygen.

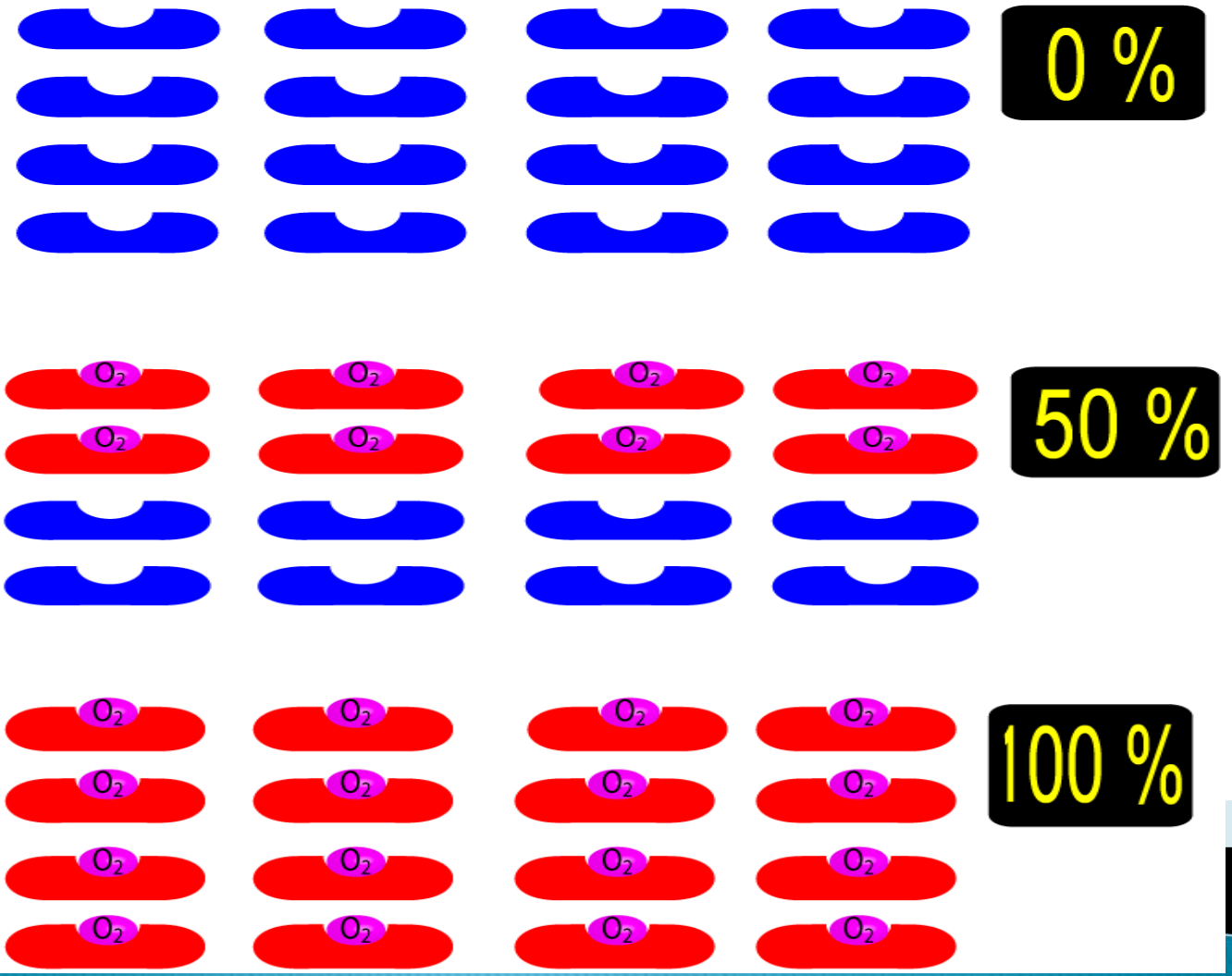
Oxygen Saturation:

Oxygen enters the lungs and then is passed on into blood. The blood carries the oxygen to the various organs in our body. The main way oxygen is carried in our blood is by means of hemoglobin.

Normal oxygen saturation values are 97% to 99% in a healthy individual on room air.



Ratio of saturation:



Working Principle:

- Pulse Oximetry consists of Red(R) and Infrared(IR) light emitting LEDs and a photo detector.
- Oxygenated and deoxygenated hemoglobin have different light absorption rate.
  - Oxygenated hemoglobin absorbs more infrared light
  - Deoxygenated hemoglobin absorbs more red light

Calculation:

$$\text{Oxygen saturation} = \frac{C(HbO_2)}{C(HbO_2) + C(Hb)} \times 100\ (\%)$$

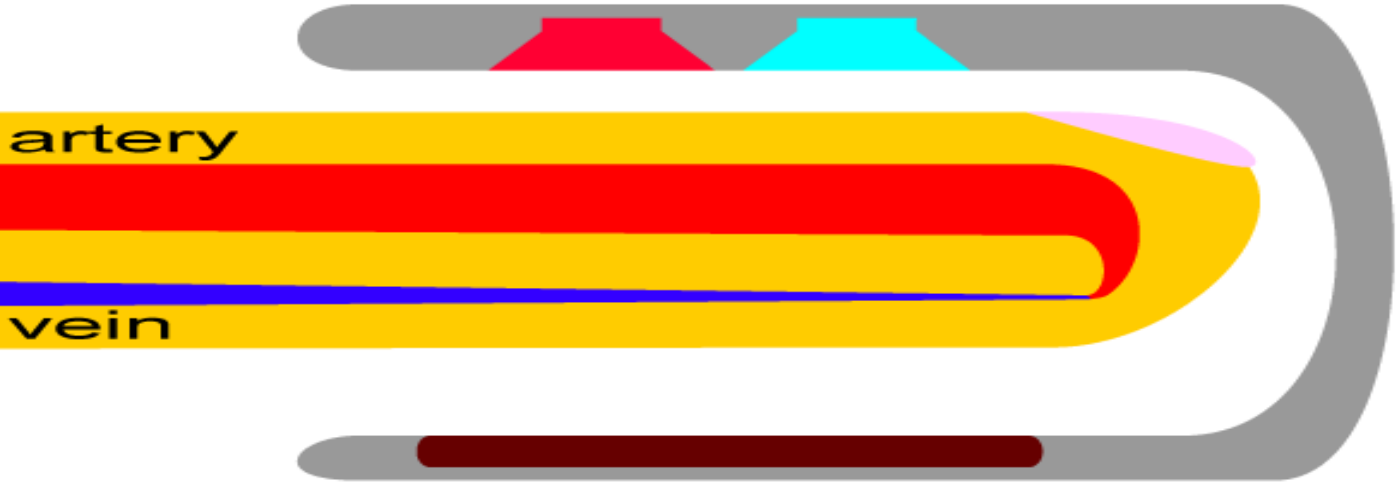
C (Hb) = Concentration of deoxygenated hemoglobin

C (HbO_2) = Concentration of oxygenated hemoglobin

Operation:

Finger is placed in between the light source and the light detector. Non absorbed light by finger reaches at detector.

Light is emitted from light sources which goes across the pulse oximeter probe and reaches the light detector.

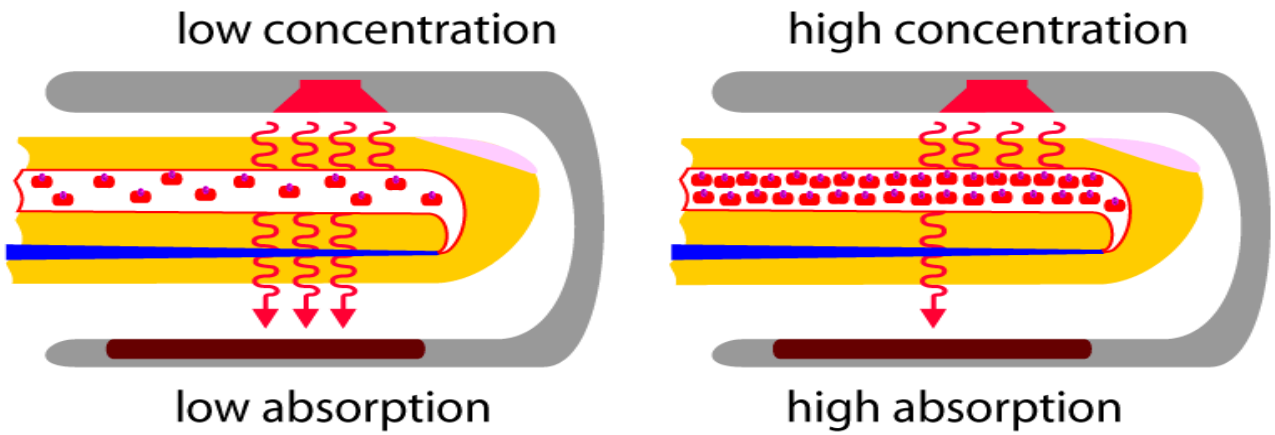


The amount of light absorbed depends on three physical properties:

1. concentration of the light absorbing substance.
2. length of the light path in the absorbing substance
3. oxyhemoglobin and deoxyhemoglobin absorbs red and infrared light differently

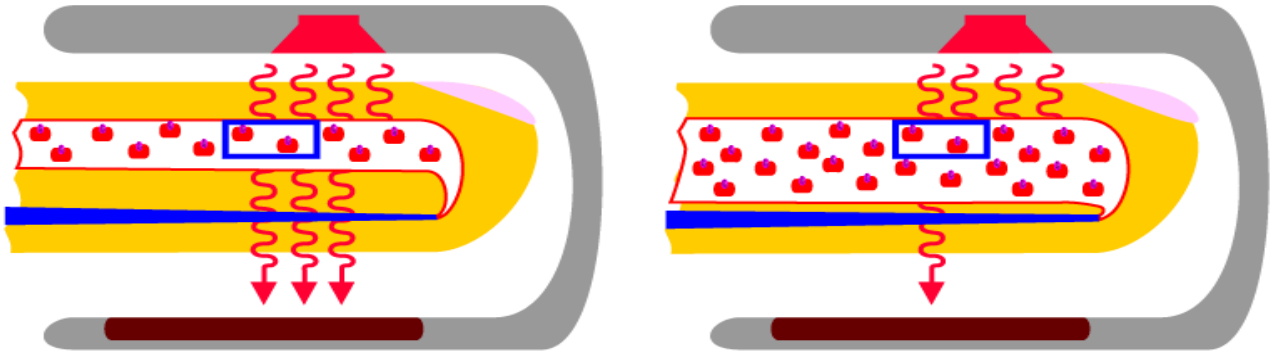
Property No.1

Amount of light absorbed is proportional to the concentration of the light absorbing substance.



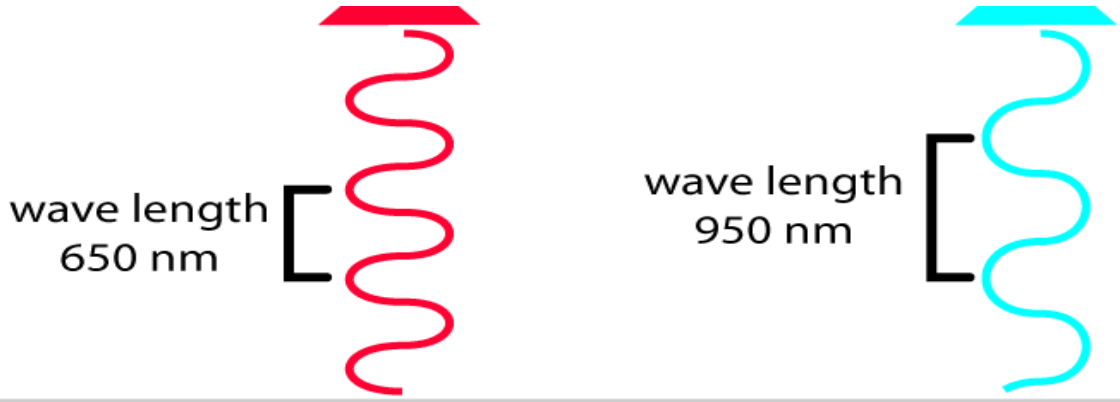
Property No.2

Amount of light absorbed is proportional to the length of the light path.

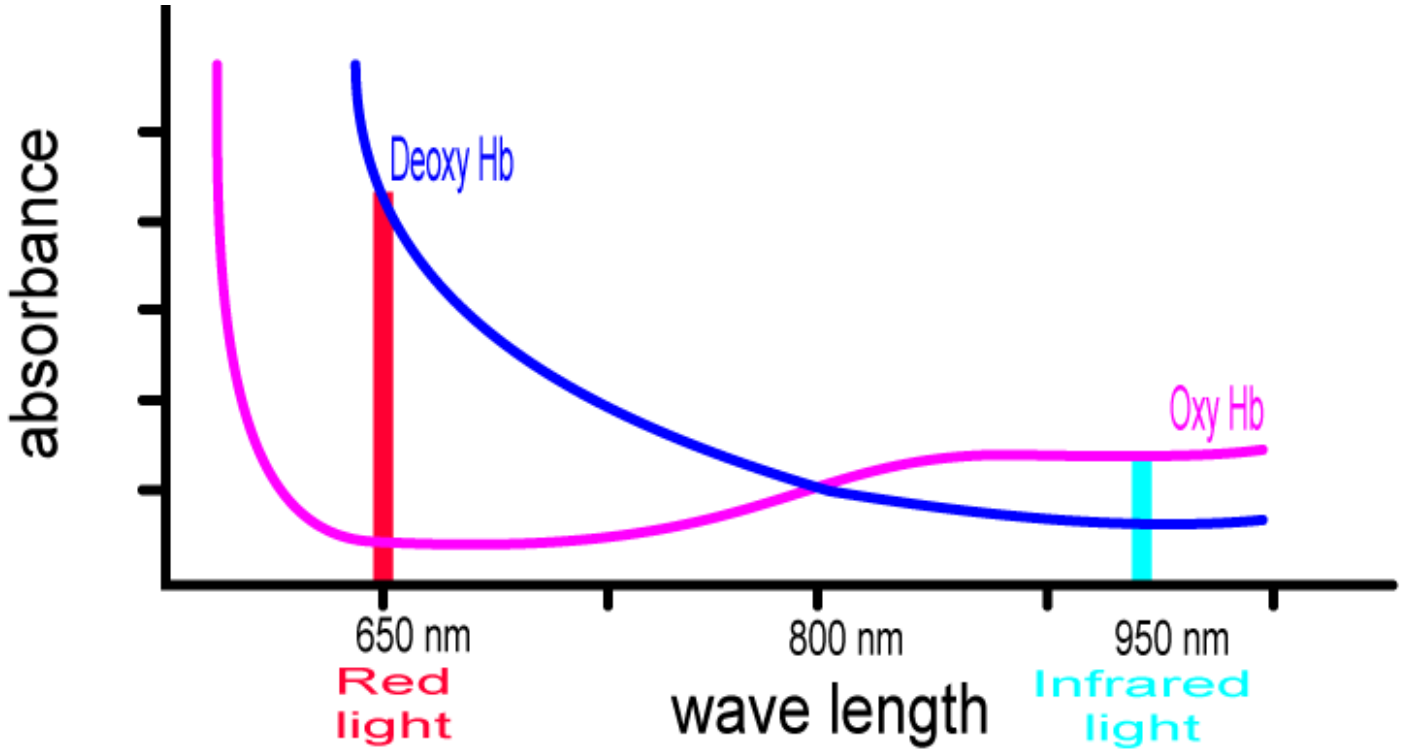


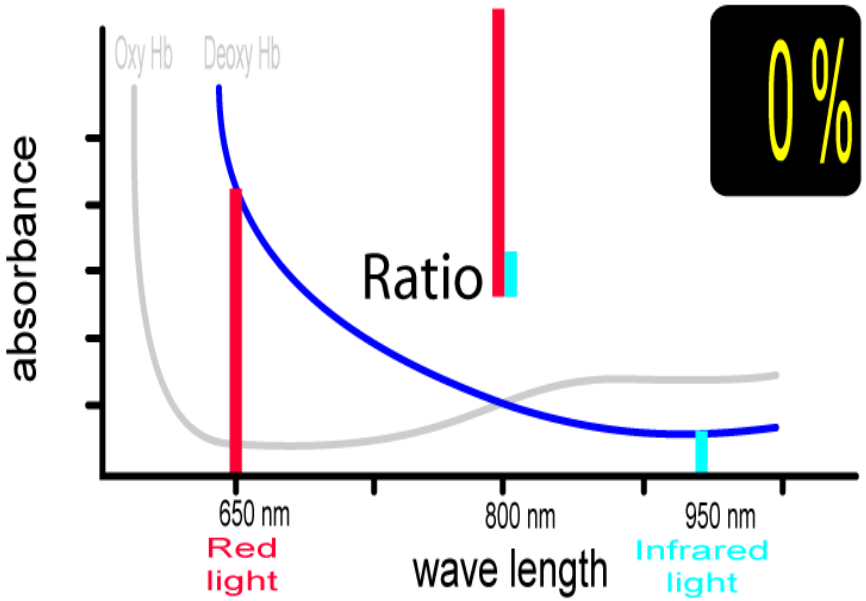
Property No.3

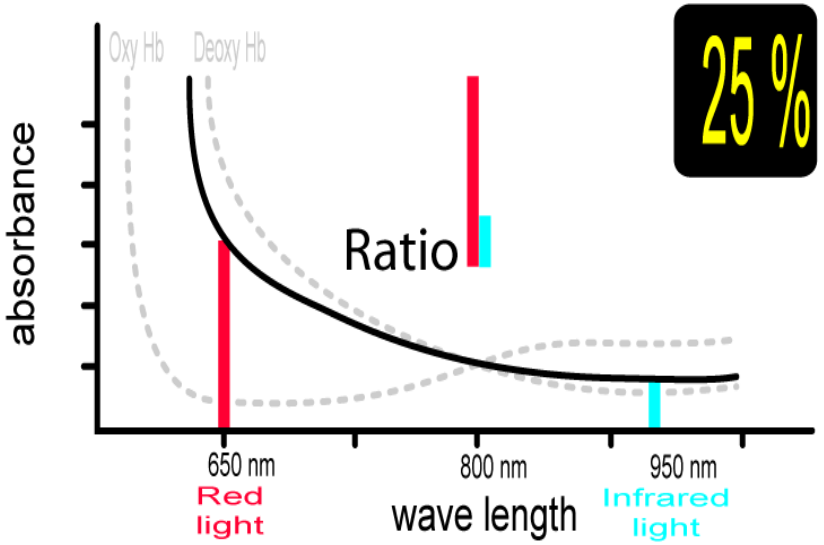
oxyhemoglobin absorbs more infrared light than red light & deoxyhemoglobin absorbs more red light than infrared light.

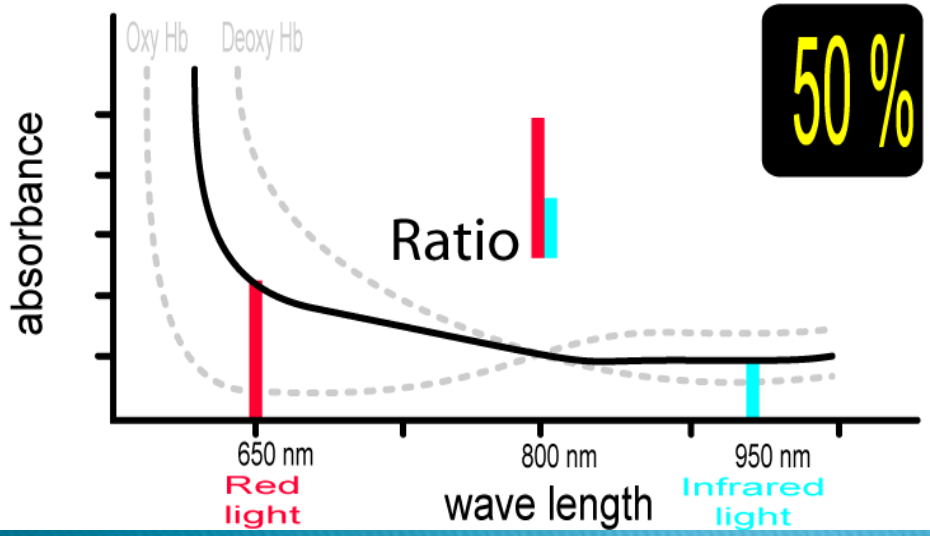


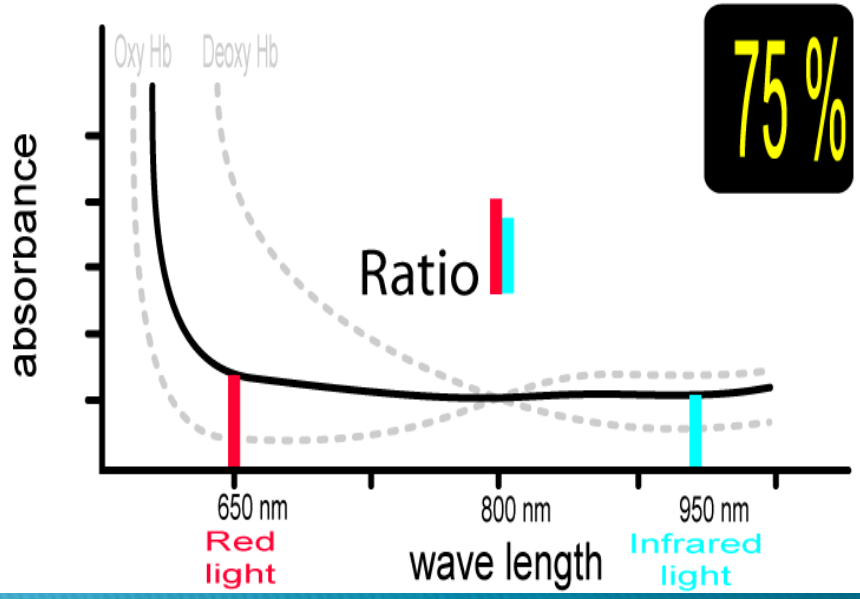
Using this ratio, the pulse oximeter can then work out the oxygen saturation.




0 %
Oxy Hb
Deoxy Hb
absorbance
Ratio
650 nm
Red
light
800 nm
wave length
950 nm
Infrared
light


25 %
Oxy Hb
Deoxy Hb
absorbance
Ratio
650 nm
Red
light
800 nm
wave length
950 nm
Infrared
light


50 %
Oxy Hb
Deoxy Hb
absorbance
Ratio
650 nm
Red
light
800 nm
wave length
950 nm
Infrared
light


75 %
Oxy Hb
Deoxy Hb
absorbance
Ratio
650 nm
Red
light
800 nm
wave length
950 nm
Infrared
light

Uses:

- Operating rooms
- ICU
- Postanesthesia care units
- Emergency departments and ambulances
- Endoscopy suites
- Sleep laboratories
- Cardiac catheterization laboratories
- Delivery suites
- Wards

TYPES OF PULSE OXIMETERS

THANK YOU !