FEB 2008
QUESTION 03

Describe the principles of measurement of arterial haemoglobin oxygen saturation using a pulse oximeter. Outline the limitations.

Pulse oximetry is a non invasive method of assessing Hb saturations based on two principles
oxyhaemoglobin and deoxyhaemoglobin have different absorption spectra
pulsitile blood can be measured independent of non pulsitile blood and other tissues

SENSOR → CPU → DISPLAY

Consists of two LEDs wavelengths:
660nm and 940nm

photodetector measures non-absorbed light after it has traversed tissue

removes the non pulsitile component. analyses the differences at the two wavelengths compares them to standardised measurements from healthy voluteers

Reports saturation as a %

Theoretical basis

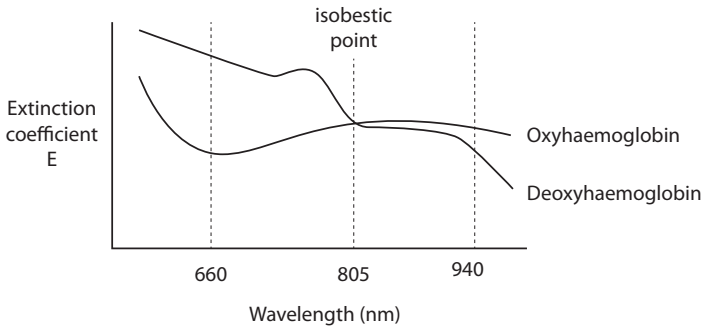
based on the absorption of light as it passes through solution due to the concentration of a solution (Beer) and the wavelength (Lambert). - Beer Lambert Law

pulsitile component of the absorbed light is called the "pulse added absorption" PAA

660nm and 940 there is significant differences between oxy and deoxy

the ratio of the PAA at 660 / 940 = R
using healthy volunteers derived R values

Sats 100%	R = 0.4
Sats 85%	R = 1.0
Sats 0%	R = 3.4



Limitations

Patient factors:
abnormal haemoglobins, methaemoglobin, carboxyhaemoglobin,
peripheral hypoperfusion - shock, hypothermia
arrythmias, venous congestion
dyes, nail polish

Sensor
Artefacts: ambient light, motion artefact not applied properly (only one diode etc), not calibrated,

CPU
different algorithms used by devices result in different values
decreased accuracy at higher paO2 due to the flat portion of the Hb-O2 curve
values are based on healthy volunteers - inaccurate at levels below 70%

Display and interpretation
poor understanding by some medical professionals regarding readings (eg sats vrs paO2)
over reliance on numbers rather than clinical condition