This viva will test your knowledge of Red Blood Cells and the Clark electrode. Outline the main functions of the red blood cell.

"What are the main functions of the red blood cell?"
Transport and storage of oxygen
Transport of CO_2
Act as an ECF buffer

"How long can blood be stored before reaching its expiry date?"
this is dependent on the preservative solution used, but is usually around 35 days
it is determined by the survival of RBCs 24 hours post transfusion (>70% is acceptable)

"In regards to the storage of blood, can you tell me what CPDA1 stands for?"
this is the most common preservative used for the storage of blood by the red cross
C - citrate - this binds calcium in the solution and therefore reduces coagulation
P - phosphate - this provides substrate for the formation of ATP and is a buffer
D - dextrose - provides a substrate for energy production via glycolysis
A - adenine - provides substrate for the formation of ATP

"What temperature is blood stored at?"
2-6 degrees as this reduces metabolism and cell death, as well as bacterial growth

"What changes are expected after a prolonged period of storage?"
loss of functional platelets and granulocytes, coagulation factors
decreased 2,3 DPG (ODC shifts to the left)
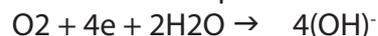small amount of haemolysis leading to increased K
decreased pH and loss of calcium

"What is the Clark electrode and what is it used to measure?"
also known as the polargraphic electrode
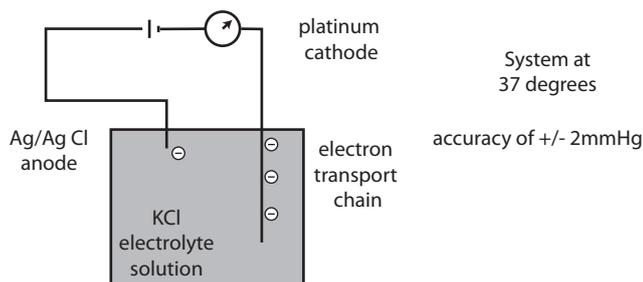
at the anode silver reacts with KCl to create electrons
basically the platinum cathode sets up an electron transport chain like in the mitochondria
$$O_2 + 4e + 2H_2O \rightarrow 4(OH)^-$$
the more oxygen the more electrons that can be taken up and therefore the greater the current
protien deposits would render the cathode ineffective if it was inserted into blood
a plastic membrane is therefore set up which is permiable to O_2 and the same set up is used

"How is the Clark electrode calibrated and what are its limitations?"
calibration is via standardised gas mixtures
limitations   O2 electrode must be clean and free from contamination
               blood sample must be recent, anaerobic and heparinised
               plastic membrane must be intact