oxidized form		reduced form	n	$\varepsilon^{o\prime}$ (V)
$NAD^+ + H^+ + 2e^-$	$\rightarrow$	$NADH$	2	-0.32
fumarate $+ 2H^+ + 2e^-$	$\rightarrow$	succinate	2	0.03
$Q + 2H^+ + 2e^-$	$\rightarrow$	QH_2	2	0.04
cytochrome c $(Fe^{3+}) + e^-$	$\rightarrow$	cytochrome c (Fe^{2+})	1	0.24
$\frac{1}{2}O_2 + 2H^+ + 2e^-$	$\rightarrow$	H_2O	2	0.82

transfer reaction			protons	Location
$NADH$	$\rightarrow$	QH_2	4	Complex I
succinate	$\rightarrow$	QH_2	0	Complex II
QH_2	$\rightarrow$	2 cytochrome C	4	Complex III
2 cytochrome C	$\rightarrow$	H_2O	2	Complex IV
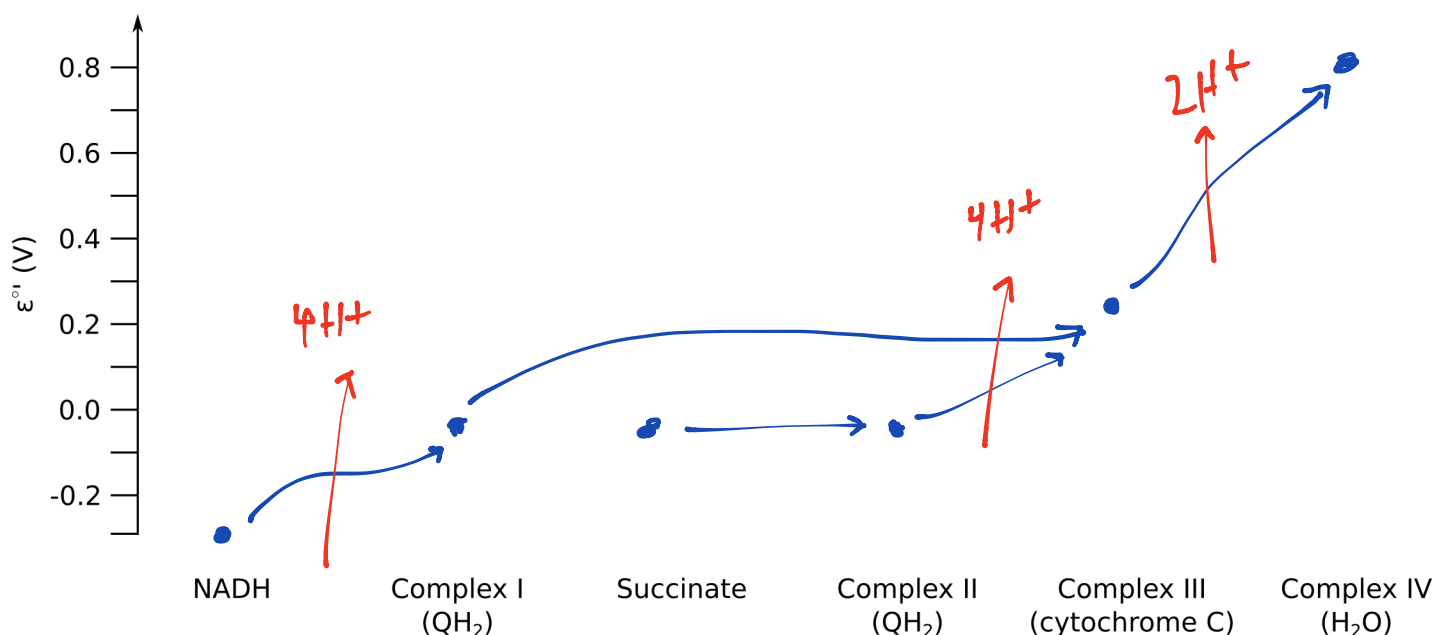
1. Fill in the diagram above. Label the proton transfer events.

2. Why does succinate have to enter at complex II rather than complex I?

COMPLEX I TRANSPORTS 4 PROTONS USING ENERGY FROM NADH + Q + H⁺ → NAD⁺+QH₂. SUCCINATE AND QH₂ HAVE SAME $\varepsilon^{o\prime}$, SO THERE IS NO ENERGY TO DO TRANSPORT. THUS, SUCCINATE e⁻ ENTER BY ALTERNATE PATHWAY.

3. Which step extracts the most useful energy for generating ATP per V? Does this surprise you?

QH₂ → Cyt.c (4 H⁺/(0.24 - 0.04 V)). SURPRISES ME. I FIGURED YOU'D GET MOST BANG OUT OF O₂→H₂O RXN. MORE ENERGY THERE.