

# Reduction Potential or $E_h$

- A measurement of the tendency of a chemical species to acquire electrons & thereby be reduced.
- Each species has its own intrinsic reduction potential
  - More positive the potential, the greater the species' affinity for electrons and tendency to be reduced
- Biology follows chemical constants; Biological redox reactions are the same reactions as an inorganic battery
- Generally Aerobes are active at positive  $E_h$  and anaerobes at negative  $E_h$

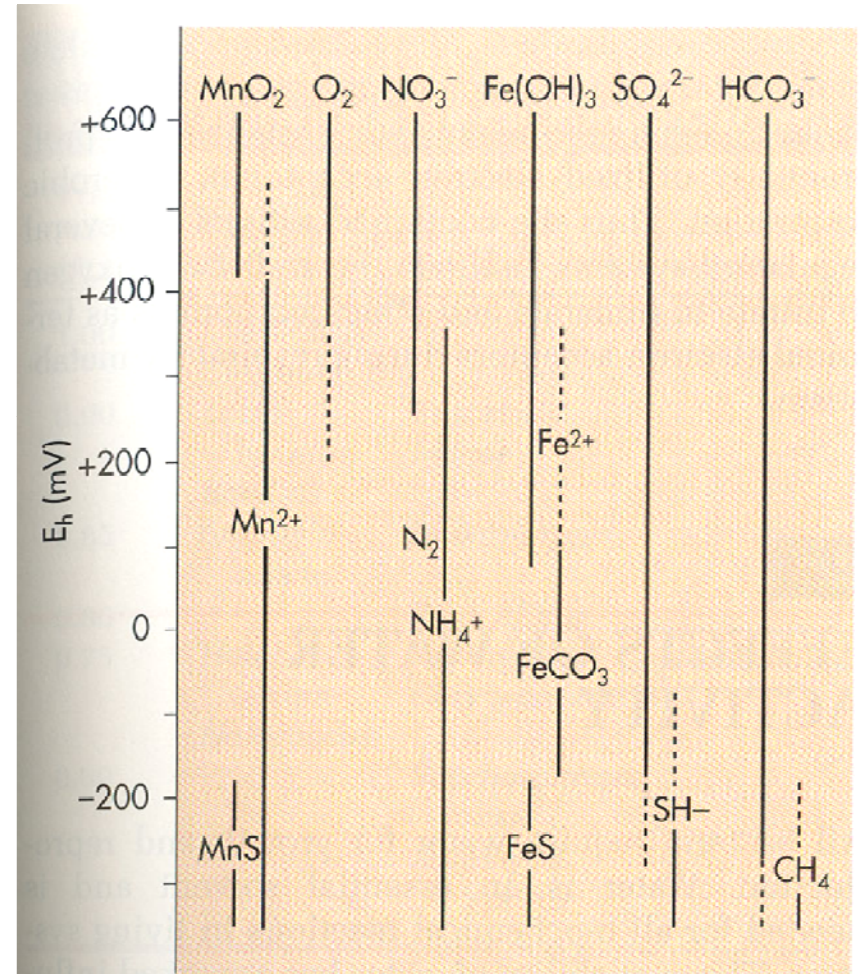


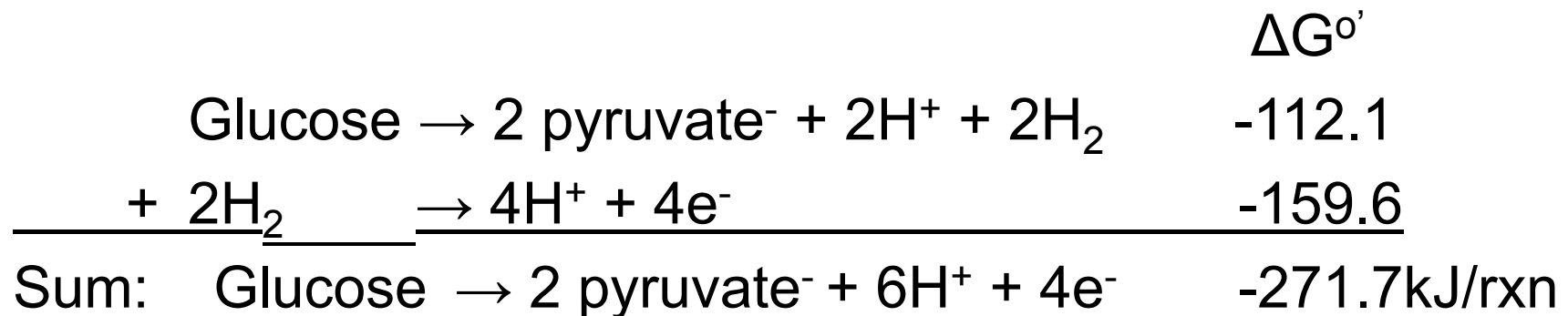
Fig. 9-26  $E_h$  Values. Ranges of  $E_h$  values for various substances. In complex systems the reduction potential is influenced by the strongest oxidant, or reductant, in that system.

# Redox Calculations

$$\Delta G = -nFE \quad \text{or} \quad E = \Delta G/nF$$

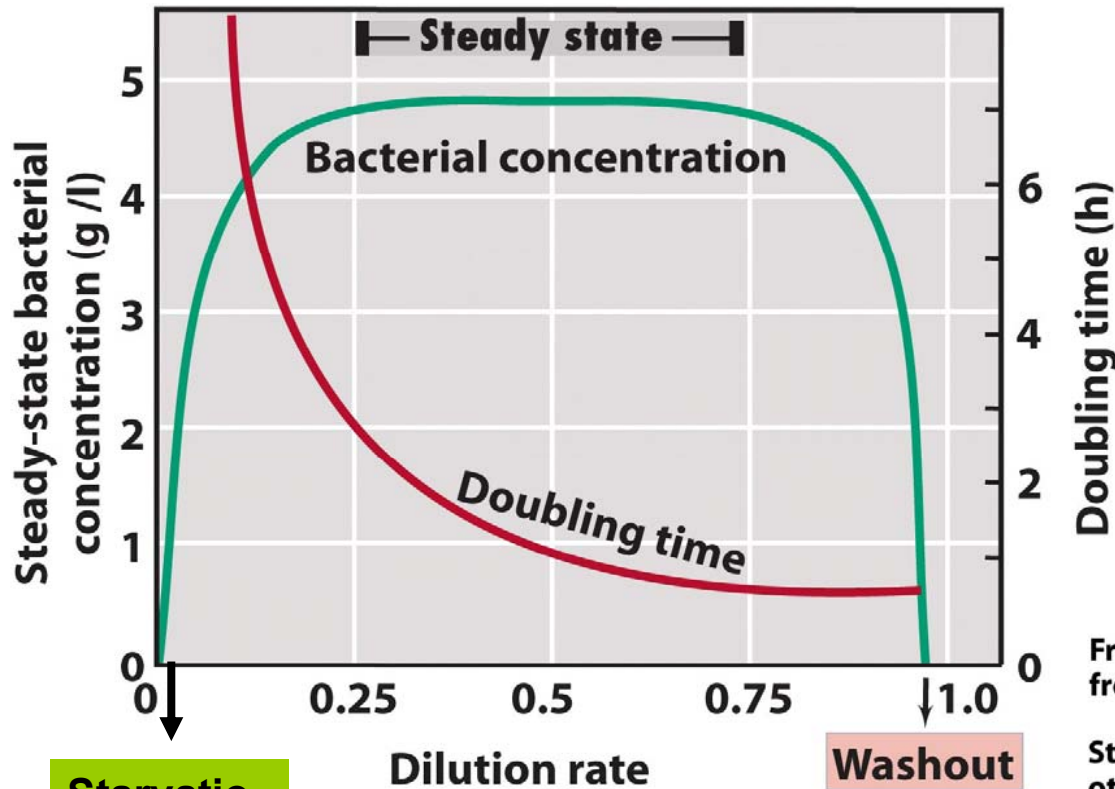
$\Delta G$ =the work exchanged by the system with its surroundings  $E$ =voltage,  
 $n$ =number of electrons involved,  $F$ =Faraday constant (96.4)

Fermentation of glucose to lactate



$$E^{\circ'} = - \frac{\Delta G^{\circ'}}{nF} = - \frac{-271.7}{4 \times 96.4} = +0.705 \text{ Volts}$$

# Chemostats



- Culture vessel operated with feeding and wasting to enable continuous culturing.
- Device that allows for the continuous culture of microorganisms with independent control of both growth rate and cell number
- Continuous culture device controlled by the concentration of limiting nutrient and dilution rate.

Starvation

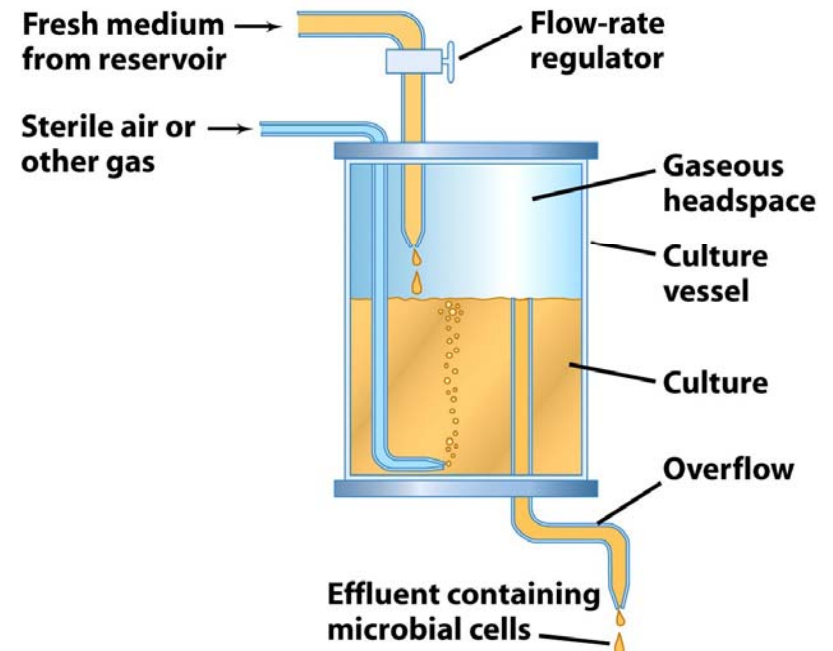
n

$$D = F/V = \mu$$

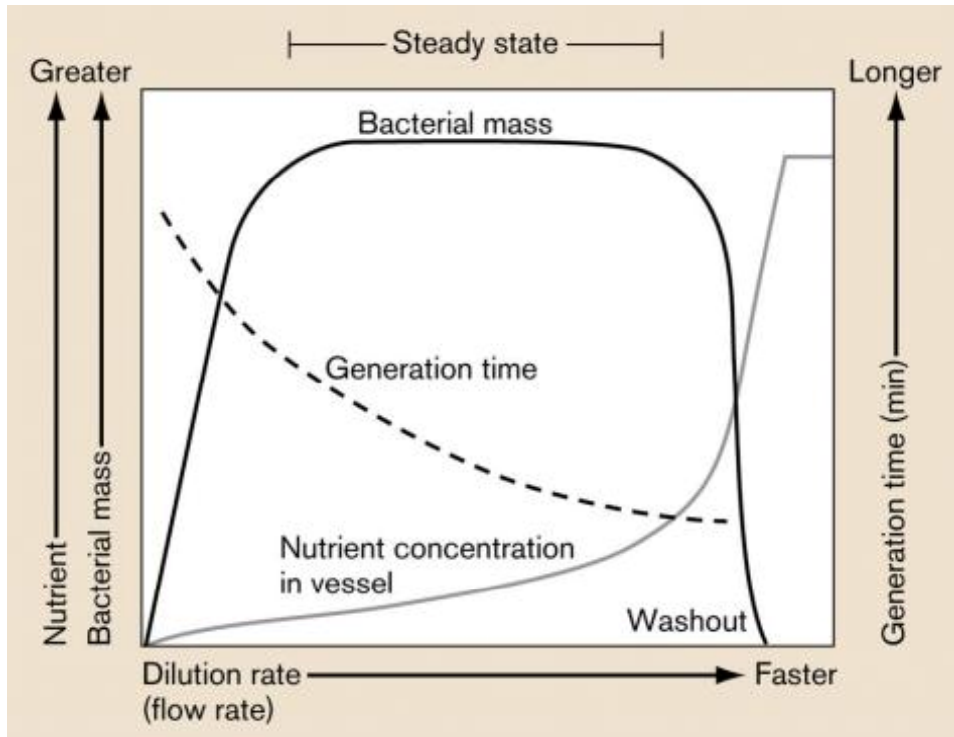
D = dilution rate, F = flow rate,  
V = volume,  $\mu$  = growth rate

Remember:

**At Steady State**

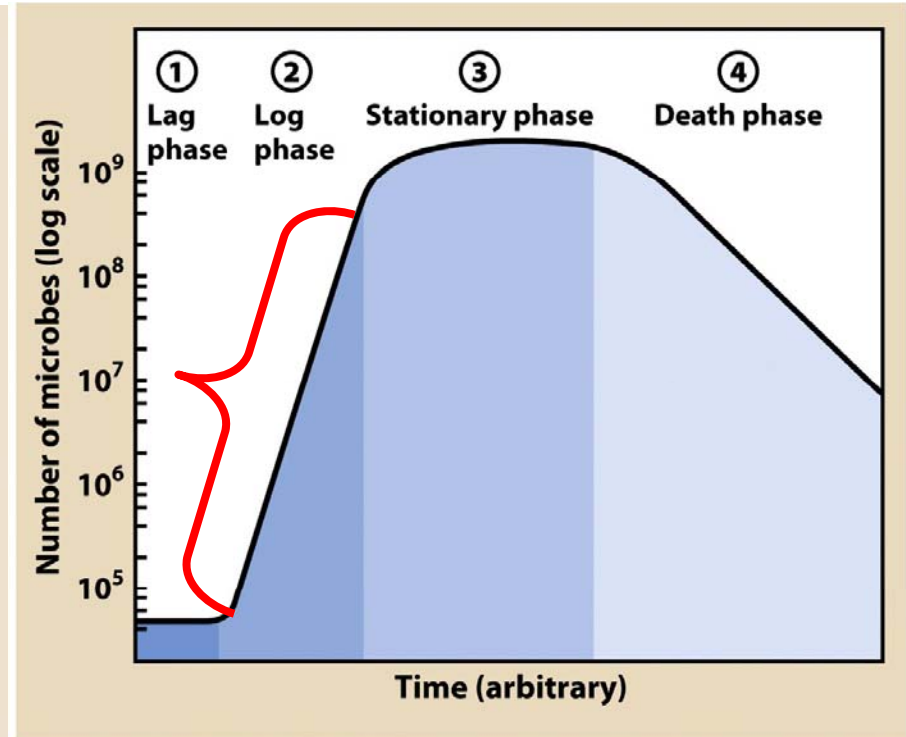


# Growth Curves



## Chemostat-continuous culture

- Doubling time determined by dilution rate

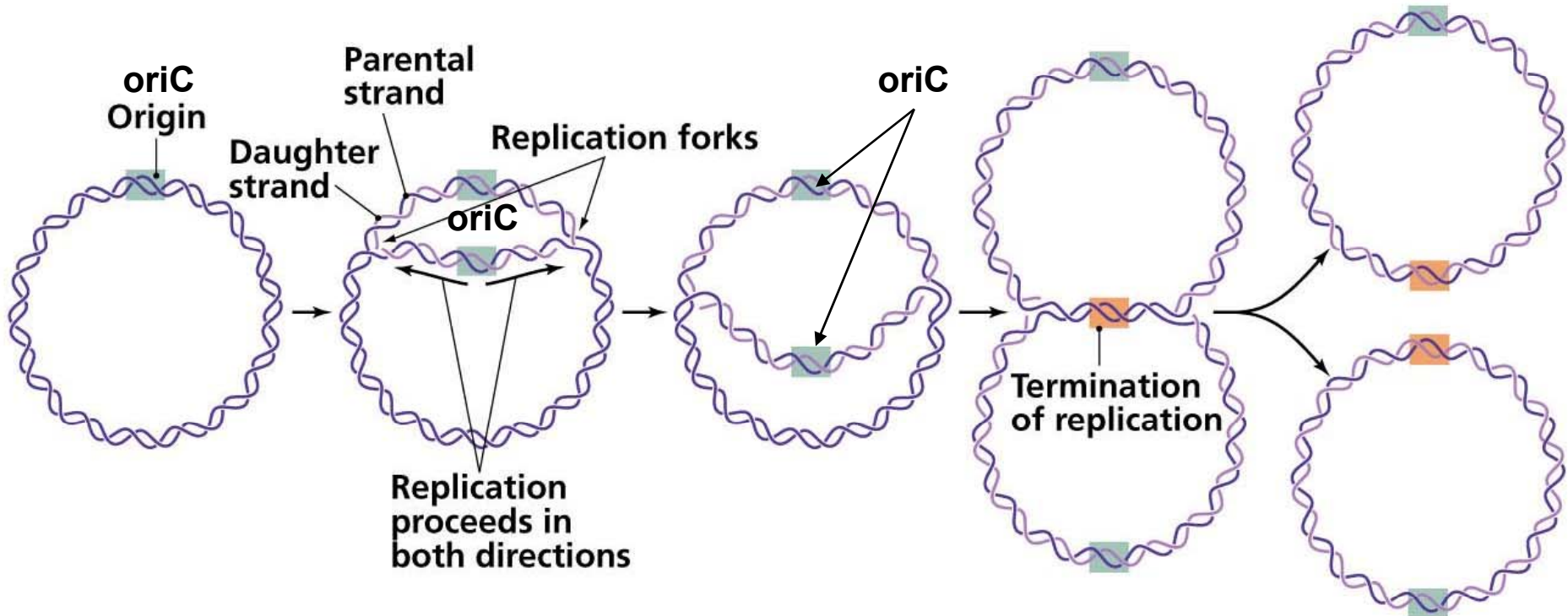


## Batch Culture

- Use slope to calculate when population doubles

Doubling time=Generation time:  
-the time needed for a population to double

# Genome Replication



Origin of Replication: where DNA replication begins

oriC: specific sequence of DNA where DNA Replication begins

In a cell that is actively replicating there are two copies of oriC, however replication only initiated once