**Protein Function**

**5.1: Compare the structures and functions of myoglobin and hemoglobin.**

* **Recognize the role of the heme prosthetic group.**

structure:

function:

location:

polarity:

interaction with O2:

* **Describe oxygen binding in quantitative terms. (calc. 5.1)**

fractional saturation (Y)/p50:

* **Identify conserved and variable residues in protein sequences.**

invariant vs. variable residues:

structural similarities/differences and homology:

* **Explain cooperative oxygen binding to hemoglobin.**

sketch of binding curves (Mb vs. Hb):

affinity for O2:

cooperativity:

conformational change:

T (deoxy) vs. R (oxy) states:

subunit interactions:

Q: What causes the conformational change from the T to R states?

* **Describe how oxygen is efficiently delivered to tissues.**

bicarbonate buffer system

Bohr effect:

BPG:

Q: What facilitates/promotes efficient transfer of O2 from Hb to tissues?

**5.2: Relate genetic variations to changes in protein function**

* **Describe the molecular defects in some hemoglobin variants**

HbS genetic variation (a.a. substitution):

physiological effects:

* **Explain why some hemoglobin defects can also be advantageous.**

heme oxygenase:

**5.3: Compare the structures and functions of structural proteins.**

* **Describe the cellular functions of actin filaments, microtubules, and intermediate filaments.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | actin filaments (microfilaments) | microtubules | intermediate filaments |
| structure |  |  |  |
| nucleotide binding/hydrolysis |  |  |  |
| polymerization |  |  |  |
| cellular function(s) |  |  |  |

* **Contrast the assembly of fibers from globular and fibrous protein subunits.**

keratin structure/polymerization:

collagen structure/polymerization:

* **Relate fiber structures to their ability to assemble and disassemble.**

dynamic vs. static:

* **Describe the amino acid sequence constraints in intermediate filaments and collagen.**

repeat sequence:

quaternary structure:

**5.4: Explain how motor proteins operate.**

* Compare the overall structure of myosin and kinesin.

|  |  |  |
| --- | --- | --- |
|  | myosin | kinesin |
| tertiary/quaternary structure |  |  |
| nucleotide binding site |  |  |
| “target” binding site |  |  |

* **Describe how the energy of the ATP hydrolysis reaction is used to perform work.**

|  |  |  |
| --- | --- | --- |
|  | myosin/actin | kinesin/tubulin |
| Initiation/ATP binding |  |  |
| ATP hydrolysis |  |  |
| Release of Pi and/or ADP |  |  |

* **Contrast the independent action of myosin and the processive action of kinesin.**

contractile vs. processive motor: