Advanced Cell Biology. Lecture 11

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Outline

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Exam 1

How proteins work

Previous final question: the answer

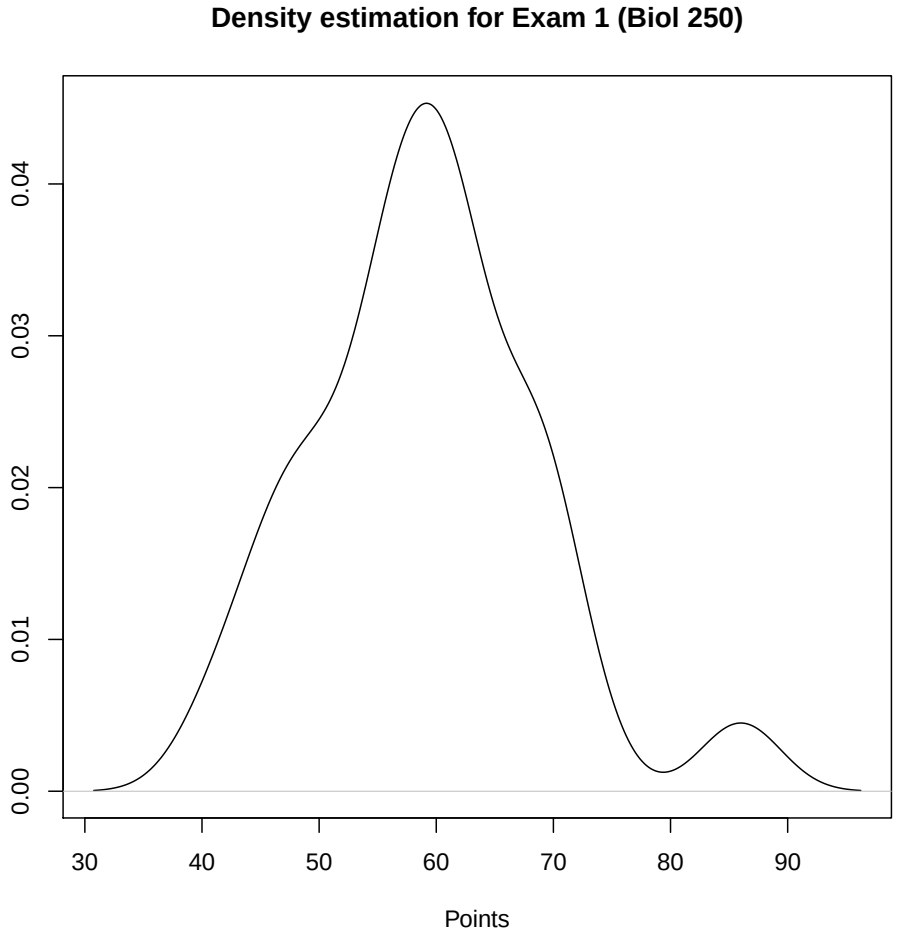
Which secondary structure is more appropriate for collagen:
α helix or β sheet?

Previous final question: the answer

Which secondary structure is more appropriate for collagen: α helix or β sheet?

- α helix

Grading the curve



2. Indicate which of the following statements is true.
   A. **Red blood cell is a living organism.**
   B. Cells of different types will always have same chemical requirements.
   C. Biggest plant cells are smaller than biggest bacterial cells.

10. The nucleus, an organelle found in eucaryotic cells, confines the _, keeping them separated from other components of the cell.
    A. lysosomes
    B. chromosomes
    C. peroxisomes
    D. ribosomes

    All answers are wrong! I am apologize for the mistake, please come if you have zero and need this point.

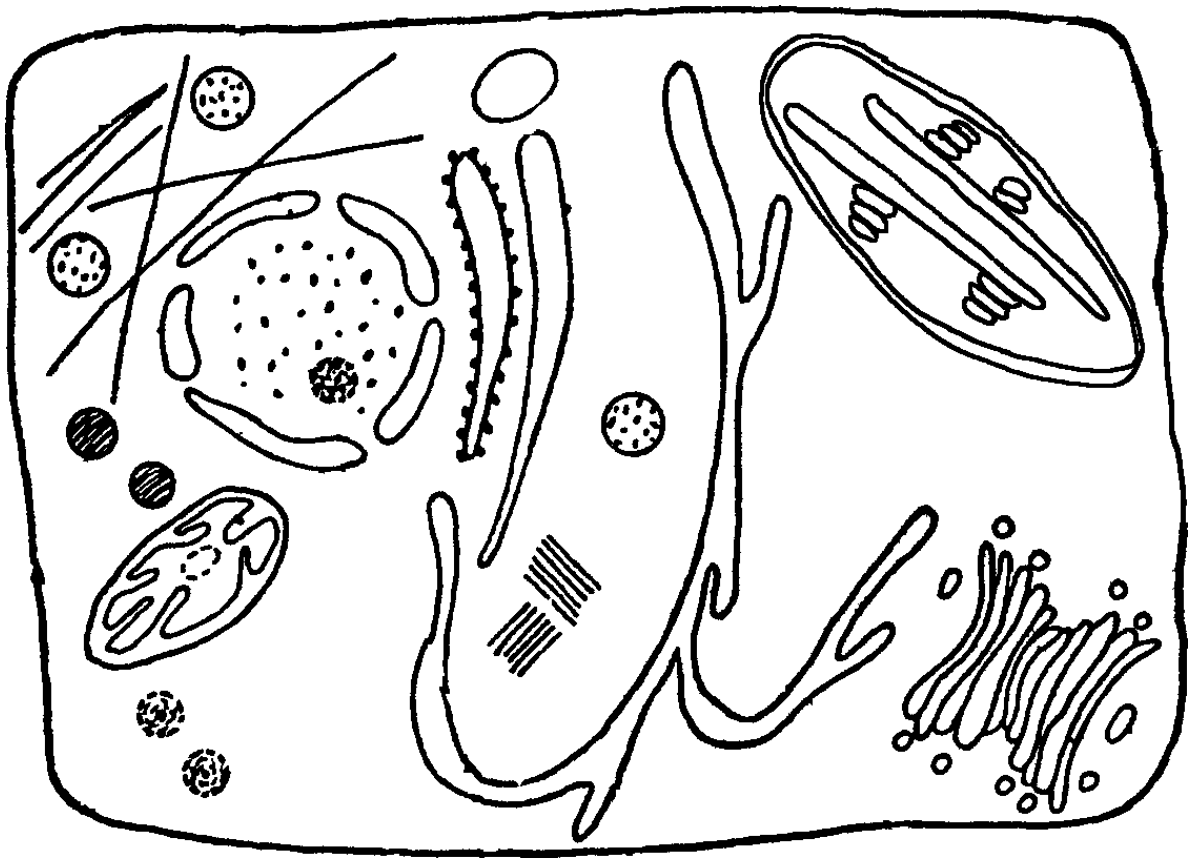
36. Arrange the following molecules in order with respect to their relative levels of oxidation (assign 5 to the most oxidized and 1 to the most reduced). Which molecule is a second?
    A. CH_2O (formaldehyde)
    B. CH_4 (methane)
    C. CHOOH (formic acid)
    D. **CH_3OH (methanol)**
    E. CO_2 (carbon dioxide)

37. Which reaction below is the most favorable?
    A. ADP + $P_i \rightarrow$ ATP; $\Delta G^\circ = +7.3$ kcal/mole
    B. **glucose 1-phosphate $\rightarrow$ glucose 6-phosphate; $\Delta G^\circ = 1.7$ kcal/mole**
    C. glucose + fructose $\rightarrow$ sucrose; $\Delta G^\circ = +5.5$ kcal/mole
    D. glucose $\rightarrow$ CO_2 + H_2O; $\Delta G^\circ = 686$ kcal/mole

38. ΔG measures the change of free energy in a system as it converts reactant Y into product X. When [Y] =[X], ΔG is equal to:
    A. $\Delta G^\circ + RT$
    B. RT
    C. $\ln \frac{[X]}{[Y]}$
    D. $\Delta \mathbf{G}^\circ$

The formula: $\Delta G^\circ = \Delta G - RT \ln \frac{[X]}{[Y]}$

39. The potential energy stored in high-energy bonds is commonly harnessed when the bonds are split by the addition of _ in a _ process.
    A. ATP, phosphorylation
    B. **water, hydrolysis**
    C. acetate, acetylation



- List cell structures which are common between prokaryotes and eukaryotes (every item $+1$ point, every mistake -1 point)

- Why there are two types of nucleic acids, DNA and RNA? Please explain

- It is known that the carbohydrate content in muscle cells and liver of animals is up to 5% of their dry weight, while in other animal cells—up to 1%. Please explain these differences

- What is easier to synthesize at industrial scale: lipids, carbohydrates of proteins? Why? Please explain

Lab 2 results

Binding

- Ligand is a molecule binding to protein
- Binding site is a specific region, “keyhole” rehion

CREP protein binds cyclic AMP

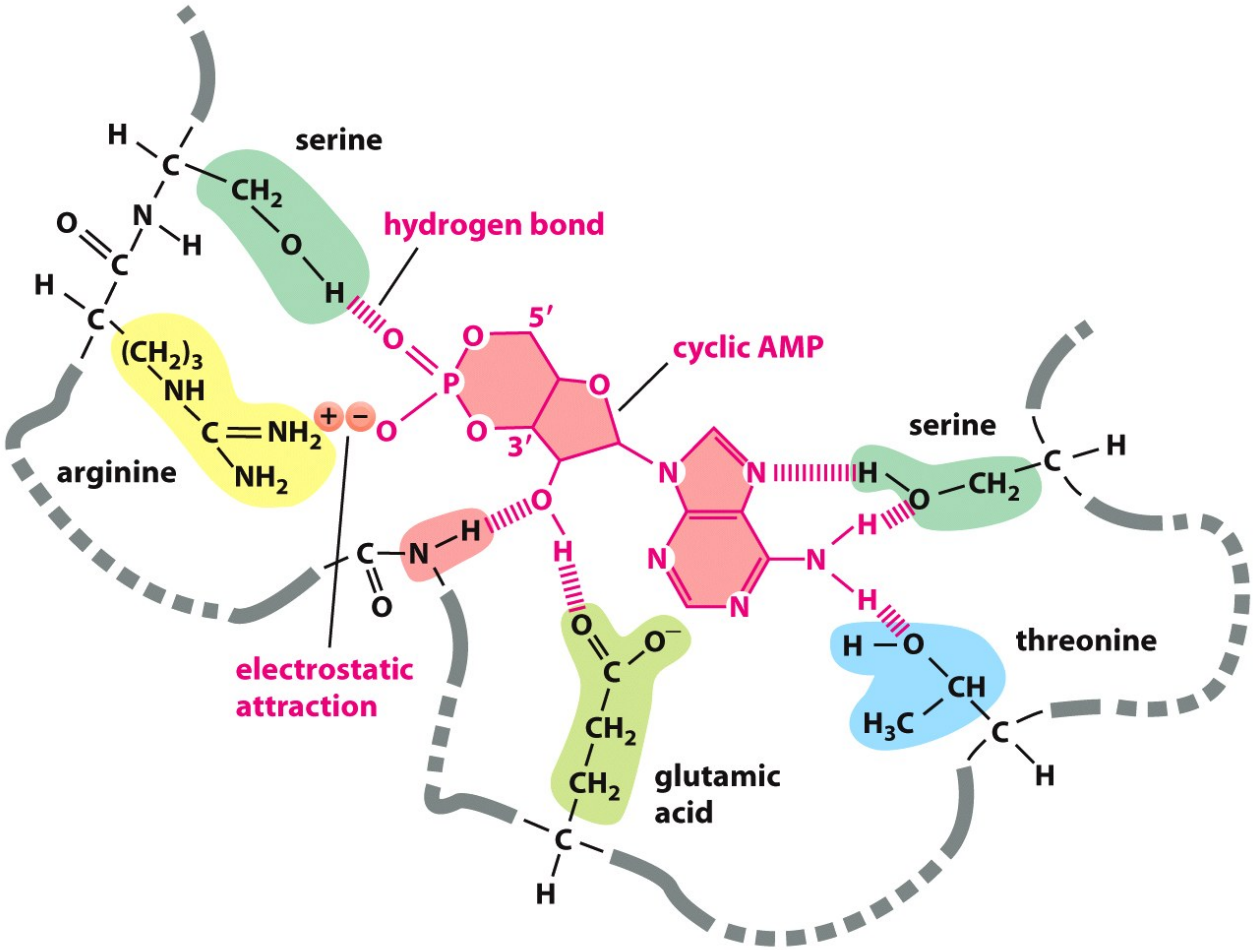


Figure 4-28b Essential Cell Biology 3/e (© Garland Science 2010)

Antibodies

- Antibodies, or γ-immunoglobulins specifically bind almost to every protein possible
- Have two heave and two light protein chains; two top regions are extremely variable in protein sequence
- They are synthesized specifically to external proteins (antigens) after being exposed to them for some time
- Grouping together, antibodies sufficiently isolate antigen and block its functions

Antibody

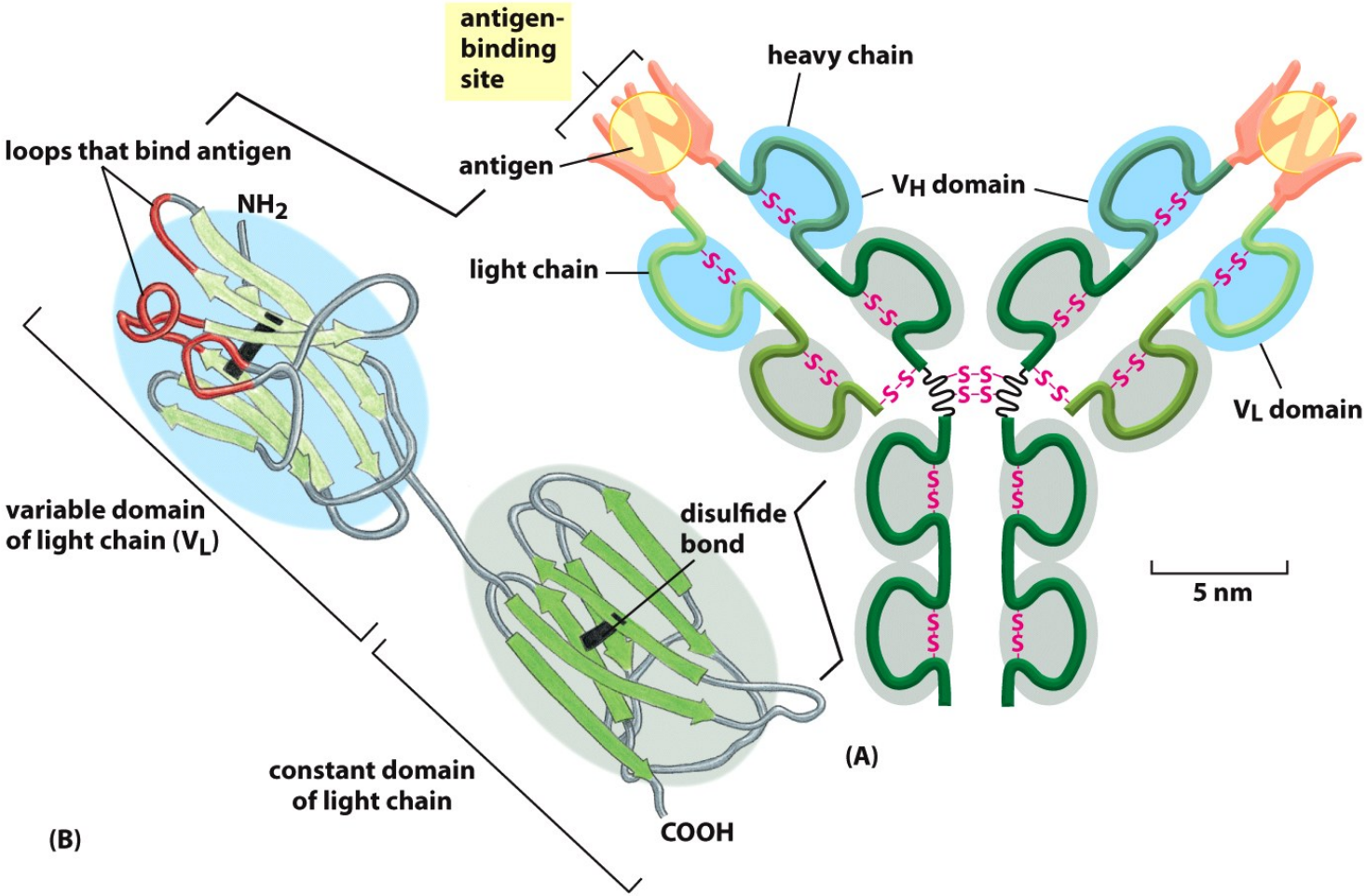


Figure 4-29 Essential Cell Biology 3/e (© Garland Science 2010)

Antibodies movie

Summary

- Almost all proteins bind to other molecules (ligands)
- Antibodies have 4 protein chains and hyper-variable regions used for binding any alien proteins (antigens)

For Further Reading

A. Shipunov.
Advanced Cell Biology [Electronic resource].
2011—onwards.
Mode of access: `http://ashipunov.info/shipunov/school/biol_250`

B. Alberts et al.
Essential Cell Biology. 3rd edition.
Garland Science, 2009.
Chapter 4: pages 141–145.