

Organic Cume, March 2004
Dr. Rainer Glaser

The cume topic *Basic Chemistry of Prion Diseases* was announced and the following two articles were recommended reading:

[1] *The Insidious March of Prion Diseases*, *Chem. Eng. News* **2003**, 45, 50-51.

[2] *Copper Binding in the Prion Protein*, Glenn L. Millhauser, *Acc. Chem. Res.* **2004**, 37, 79-85.

(1) *Bacteria, Viruses, Prions*. For each, name three diseases and the animal or human affected by the disease. (18 points)

The bacteria	cause	in
The bacteria	cause	in
The bacteria	cause	in
The virus	causes	in
The virus	causes	in
The virus	causes	in
The prion	causes	in
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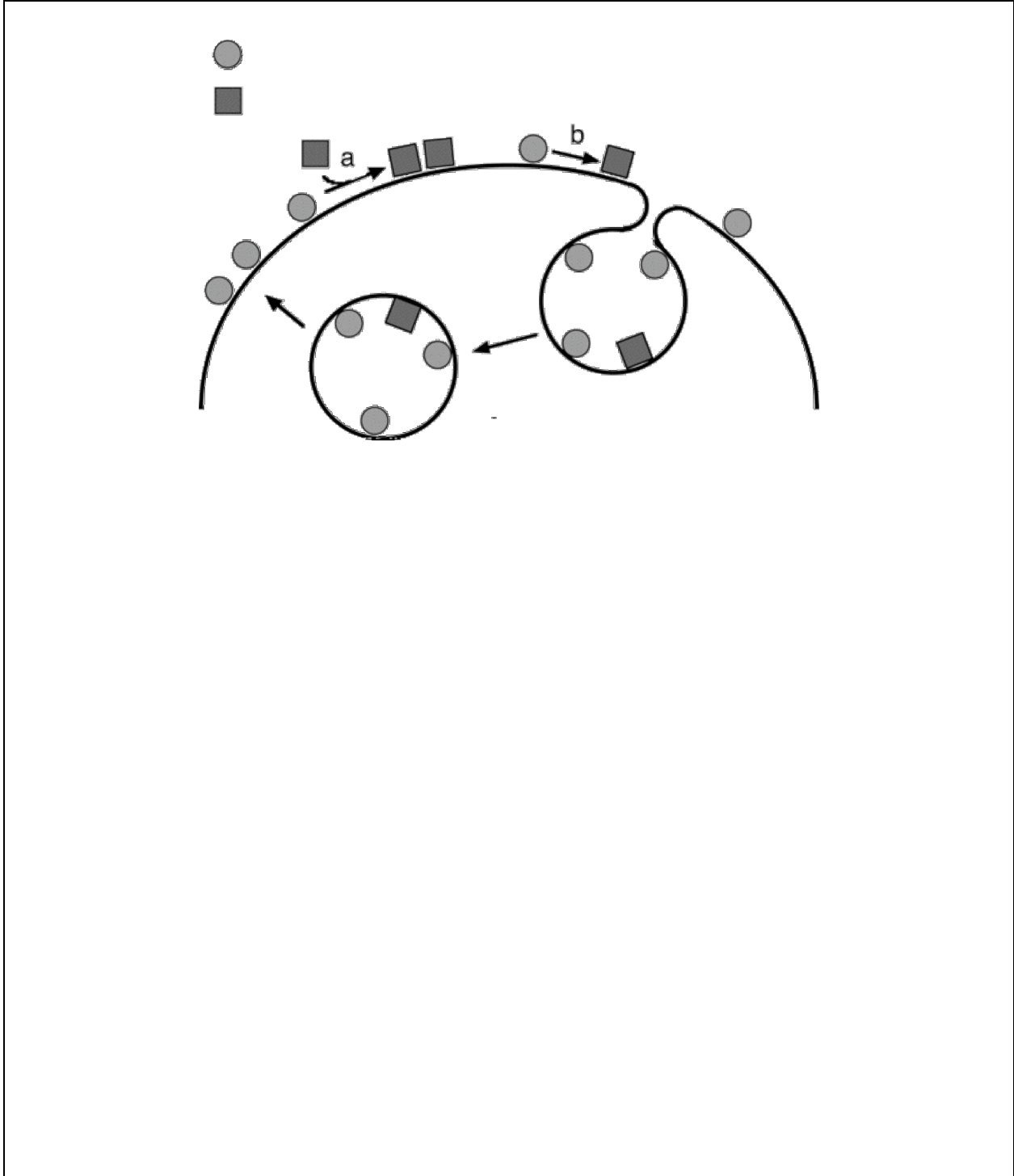
(2) *Bacteria, Viruses, Prions*. Explain in very simple terms what each of these items is made of (How large? Does it breathe, eat, replicate? Made of what kinds of molecules?) and how it causes disease. (15 points)

Bacteria.

Viruses.

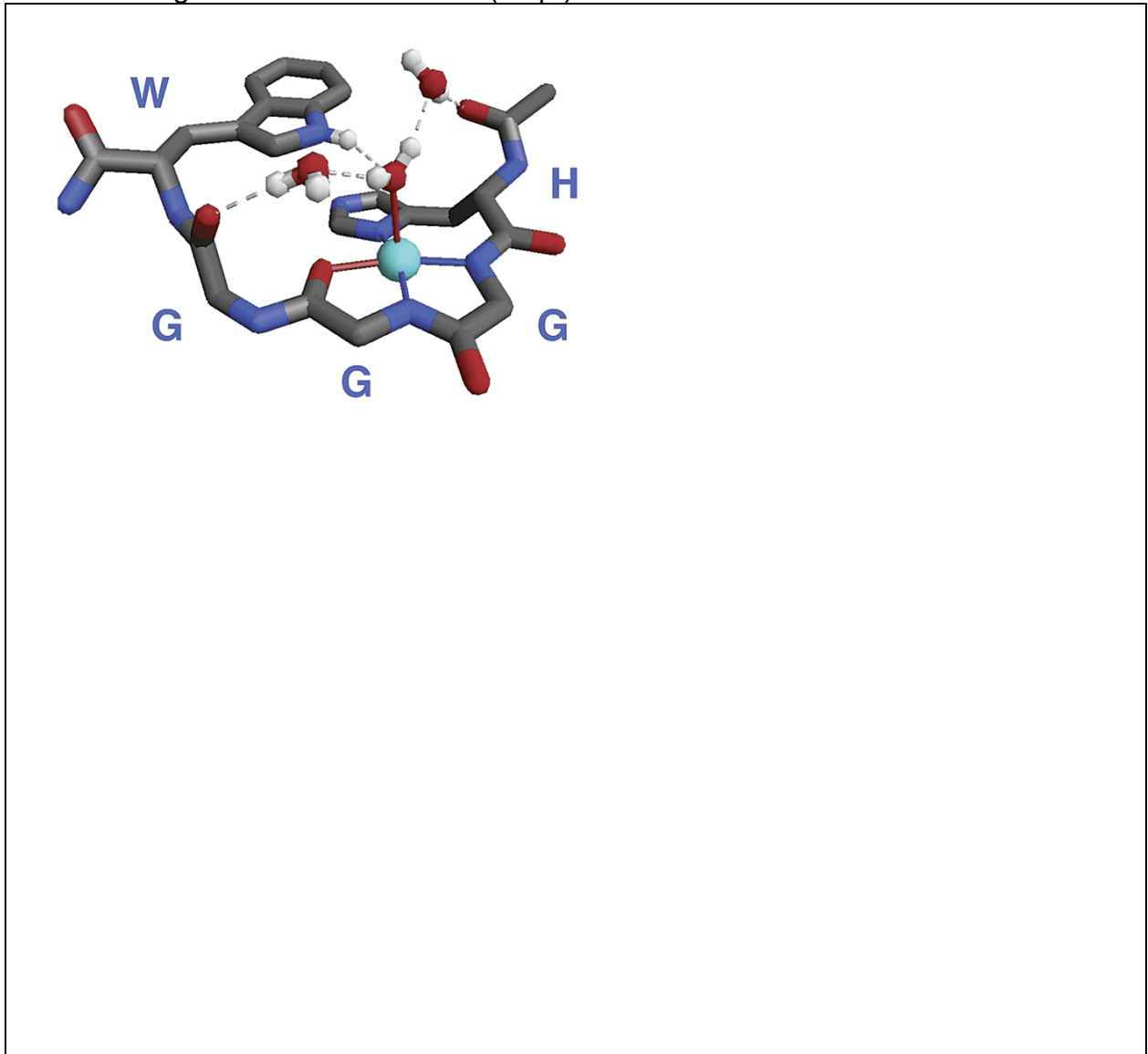
Prions.

(3) The diagram is a reproduction of **Figure 1** of the *Account*. Explain what the small circles are to symbolize; give full name and abbreviation. Explain what the small squares are to symbolize; give full name and abbreviation. Explain what each of the “reactions” are which are signified by processes “a” and “b”. Write down where all this is happening. (10 p.)



(4) Name two of the three hypotheses which are being discussed as possible functions of the normal prion protein. (10 p.)

(5) A reproduction of **Figure 3** of the Account is shown. Draw a normal chemical structural diagram of what is shown. (20 p.)



(6) The copper binding affinity K_d is said to indicate “cooperative binding” in the “low micromolar to nanomolar range.” Explain how K_d is defined. Explain the meaning of “cooperative binding”. Explain what it means if the binding is in the “low micromolar to nanomolar range.” (9 p.)

(7) Describe, roughly, what kinds of experiments led in the mid-1990s to the suggestion that the prion protein binds copper ions? (8 p.)

