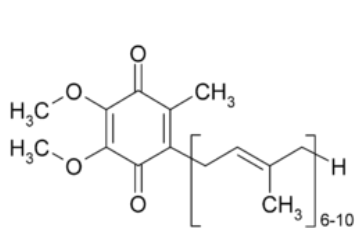
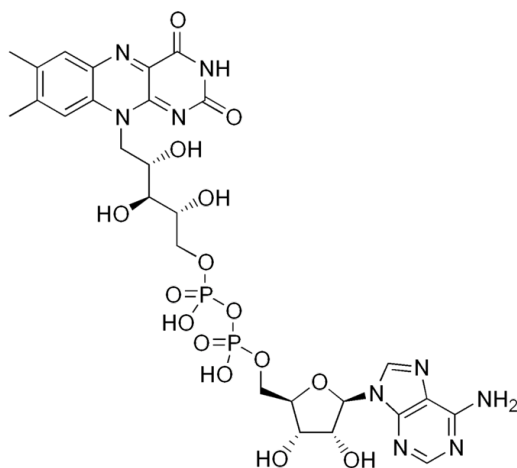


生物有機化学 I 試験 (2011.8.3)

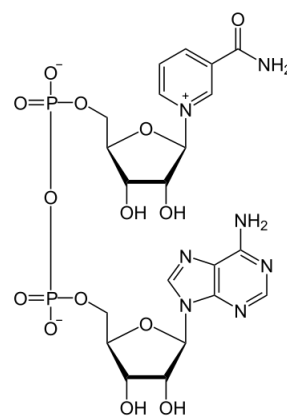
1. 生体内の酸化還元反応に関与する補酵素(1)~(3)の還元型の構造式を書け。



(1)



(2)



(3)

2. 次の各文と関係のある（文全体から思い浮かぶ）農薬の名前と構造式を書け。またなぜそう考えたのか（それが思い浮かんだのか）理由を述べよ。

(1) The various neurotransmitters are not simply functional equivalents of acetylcholine. Rather, many of them have distinctive physiological roles. For example, γ -aminobutyric acid is inhibitory rather than excitatory neurotransmitters. The receptor for this substance is ligand-gated channels that are selectively permeable to Cl^- . Hence, its opening tends to hyperpolarize the membrane (makes its membrane potential more negative) rather than depolarize it. A neuron inhibited in this manner must therefore be more intensely depolarized than otherwise to trigger an action potential.

(2) The two chlorophyll *a* rings are presumed to form photosystem II's primary electron donor, P680 (named after the wavelength at which its absorbance maximally decreases on photooxidation). The electron ejected from P680 is transferred to a molecule of pheophytin *a*, probably via a chlorophyll *a* molecule and then to a bound plastoquinone. The electron is subsequently transferred to a second plastoquinone in a like manner, takes up two protons at the stromal surface of the thylakoid membrane. The resulting plastoquinol then exchanges with a membrane-bound pool of plastoquinone molecules.

(3) Microtubules, which consist mainly of the protein tubulin, are tubular structures, $\sim 250 \text{ \AA}$ in diameter and comprise the major components of such cellular organelles as the mitotic spindle and cilia. Tubulin consists of two 40% identical, ~ 450 -residue subunits named α -tubulin and β -tubulin, both of which are highly conserved among eukaryotes. The structure of tubulin reveals

that the core of each tubulin subunit consists of a 4-stranded and a 6-stranded β sheet surrounded by 12 α helices. The two subunits associate in head-to-tail fashion to form the heterodimer.

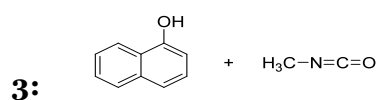
(4) As a nerve impulse reaches a given patch of nerve cell membrane, the increased membrane potential induces the transient opening of the Na^+ channels so that Na^+ ions diffuse into the nerve cell at the rate of $\sim 6000 \text{ ions} \cdot \text{ms}^{-1}$ per channel. This increase in the permeability to Na^+ causes the membrane potential across the membrane to increase, which, in turn, induces more Na^+ channels to open, leading to an explosive entry of Na^+ into the cell.

(5) Mitchell postulated that Complex III functions in a way that permits one molecule of reduced ubiquinone, the two-electron carrier, to sequentially reduce two molecules of cytochrome *c*, a one-electron carrier, while transporting four protons. This occurs via a redox loop mechanism so-called Q cycle, through which Complex III pumps protons from the matrix to the intermembrane space. The essence of the Q cycle is that reduced ubiquinone undergoes a two-cycle reoxidation in which the semiquinone is a stable intermediate.

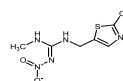
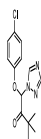
3. 次の化合物 **1** から **5** は何か？ 用途や作用を説明せよ。(1~3 は構造式も示すこと)

1: Methyl 2-[4-(2,4-dichlorophenoxy)phenoxy]propionate

2: 2,4-Dichlorophenoxyacetic acid



の生成物



4

5

4. ある化合物 A は、たいへん低い濃度で殺虫作用を示すにもかかわらず、哺乳動物に対する急性毒性がとても弱いということがわかった。考えられる理由を述べよ。