Name:_____ **Points:**_____

Prof. K. C. Nicolaou **Final Exam**

CHEM 151 - Molecules that Changed the World **March 19, 2009**

UCSD, Department of Chemistry and Biochemistry

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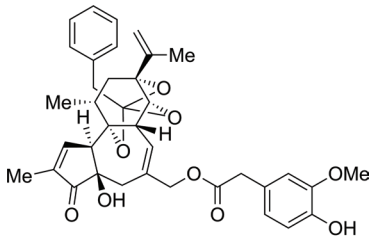
1. Match the following **names** with the appropriate **structure**: ginkgolide B, amphotericin B, rapamycin, brevetoxin B, Taxol®, palytoxin, calicheamicin γ_1^I, epothilone B, vancomycin, resiniferatoxin (20 points)



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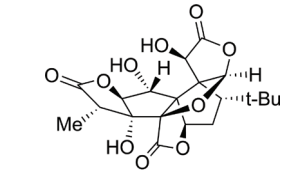

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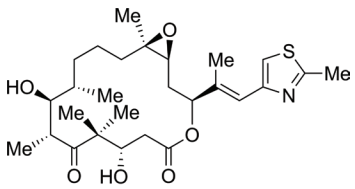

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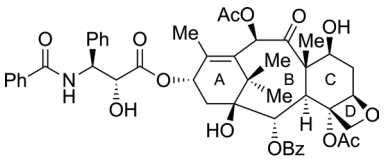

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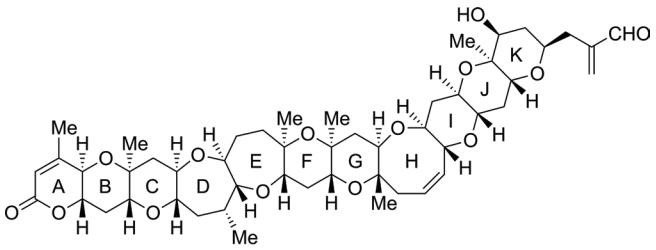

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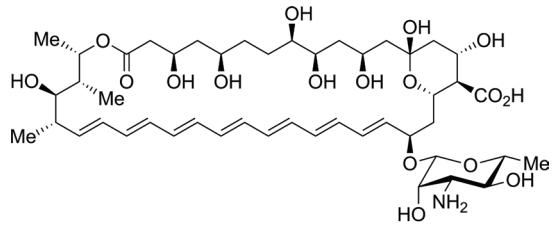

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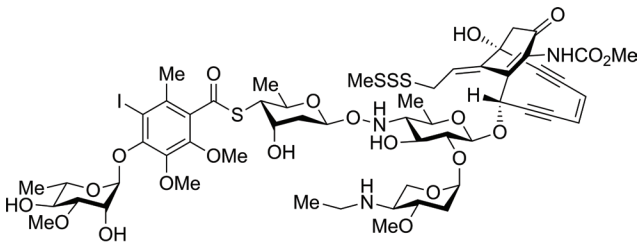

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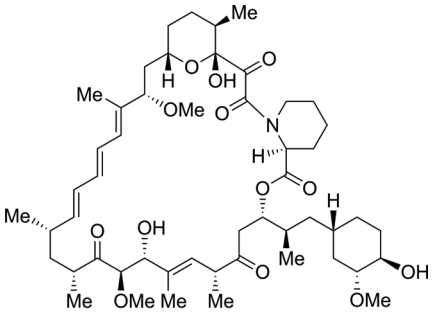

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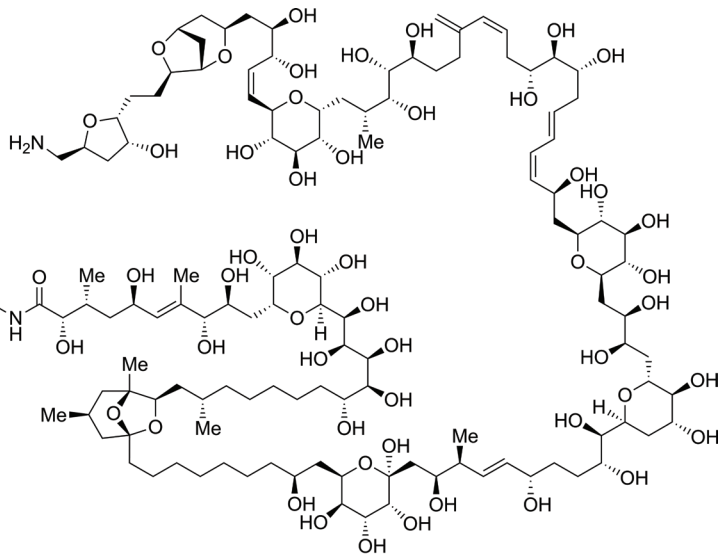

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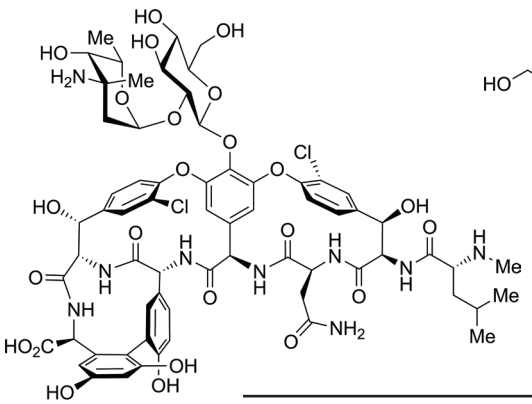

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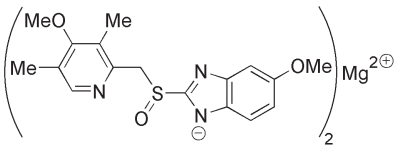
2. Match each of the following **medicines** with the appropriate molecular **structure** and **mechanism of action**: Nexium®, AZT (Retrovir®), Valium®, Viagra®, Prozac® (15 points)

Molecular Structure



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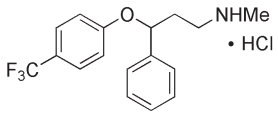

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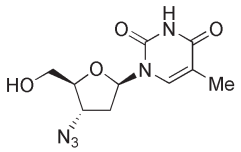

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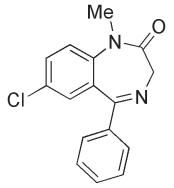

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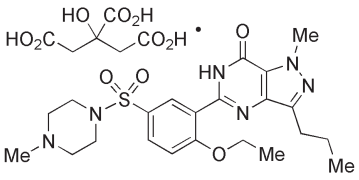

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_____ _____

Mechanism of Action

A. Inhibits phosphodiesterase type5 (PDE5), an enzyme that cleaves and inactivates the messenger cyclic quanosine monophosphate (cQMP)

B. Binds to GABA receptors

C. Inhibits serotonin re-uptake, leading to higher levels of the neurotransmitter in the synapse

D. Inhibits the HIV enzyme reverse transcriptase

E. Blocks the $H^{\oplus}/K^{\oplus}$–ATPase, an enzyme that pumps acid into the stomach

Medical Indication

I. antidepressant drug

II. erectile dysfunction drug

III. antianxiety drug

IV. anti-ulcer drug

V. anti-AIDS drug

3. Name three (3) major **pharmaceutical** companies and two (2) successful **biotechnology** companies as well as five (5) **biologic drugs**, indicating the **medical indication** for each (15 points).

Major pharmaceutical companies:

1. _____

2. _____

3. _____

Biotechnology companies:

1._____

2._____

Biologic drugs:

1. _____

2. _____

3. _____

4. _____

5. _____

Indication:

_____

_____

_____

_____

_____

4. Name five (5) **natural products** used as medicines and indicate their **medical indication** (10 points).

Natural Product:

1. _____

2. _____

3. _____

4. _____

5. _____

Indication:

_____

_____

_____

_____

_____

5. Name one **Nobel Laureate** associated with the following (20 points):

1. Fundamental studies on the biochemistry of nucleic acids with particular regard to recombinant DNA _____

2. Contributions concerning the determination of base sequences in nucleic acids _____

3. Development of methodology for chemical synthesis on a solid matrix _____

4. Development and use of molecules with structure-specific interactions of high selectivity _____

5. Contributions to carbocation chemistry _____

6. Fundamental contributions to the establishment of oligonucleotide-based, site-directed mutagenesis and its development for protein studies _____

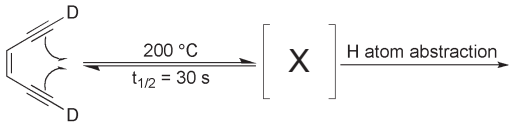
7. Conformation and its application in chemistry _____

8. Research into the nature of the chemical bond and its application to the elucidation of the structure of complex substances _____

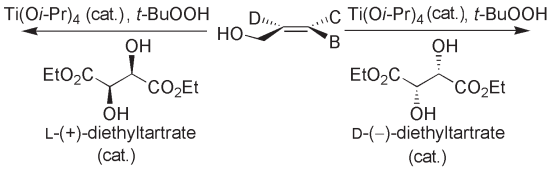
9. Work on the structure of proteins, especially that of insulin _____

10. Invention of the polymerase chain reaction (PCR) method _____

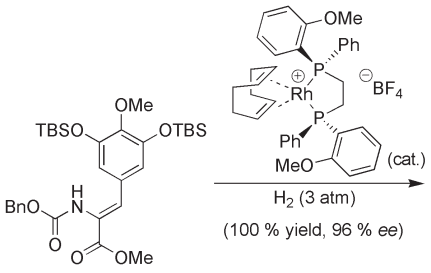
6. **Name** (type of reaction and scientist associated with it) each of the following reactions and give the **structure** of the product (in box) in each case (20 points).



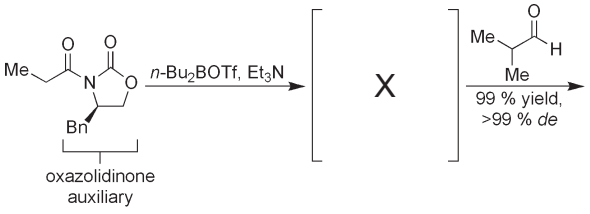
1. _____



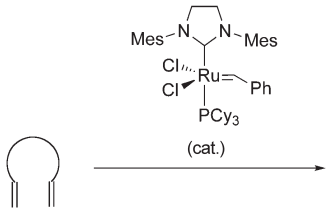
2. _____



3. _____



4. _____



5. _____

7. In the box below, describe (150 words or less) the **Drug Discovery and Development Process** indicating the roles played by **biologists and biochemists**, **medicinal chemists**, **process chemists**, **pharmacologists**, and **medical doctors** (20 points).