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## Year 12 Medicinal Chemistry Topic Test

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### Question 1

Eucalyptus oil is a well-known essential oil extracted from the leaves of the eucalyptus plants and is used for many medicinal purposes in both traditional and western practices. To extract the oil from the plant often steam distillation is used. Describe how the oil would be extracted from this method. **4 marks**

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### Question 2

Proteins can only be fully functional when the tertiary structure is complete. List the 5 types of bonds and attractions formed in this stage. **5 marks**

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### Question 3 (7 marks)

Enzymes are a type of protein that serve as biological catalysts to speed up chemical reactions in the human body. Without them, vital chemical processes in the body would proceed too slowly to keep up with the energy demands of a human being.

- i. How is an enzyme able to increase the rate of a reaction. **2 marks**

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- ii. Lactase is an enzyme that breaks down lactose, a sugar in milk. Explain why an enzyme like sucrase would not be able to carry out the same role. **2 marks**

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- iii. Discuss how temperature influences the rate of reaction. **2 marks**

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iv. Valine is an amino acid. Draw the zwitterion in the space below.

1 mark

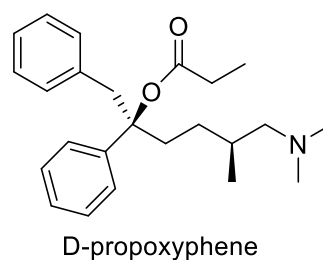
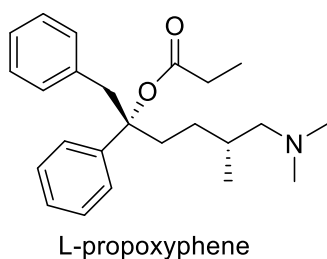
### Question 4

The instructions on a packet of jelly specifies not to use pineapple when preparing the dessert. Suggest a reason why.

2 marks

### Question 5

Propoxyphene is an opioid; a medication administered for mild to moderate pain. L-propoxyphene is an enantiomer that acts primarily as a cough suppressant whereas D-propoxyphene acts as a mild pain reliever. Both the structures are shown below.



D-propoxyphene and L-propoxyphene have distinct clinical uses despite being mirror-image molecules. Explain how chirality contributes to these differences.

3 marks

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### Question 6 (8 marks)

Relenza is an antiviral medication used to treat and prevent influenza A and B. It is a competitive enzyme inhibitor to prevent new viral particles from infecting more cells.

- i. Discuss how Relenza works as a competitive enzyme in terms of the lock and key model. **3 marks**

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- ii. How does the concentration of the substrate impact the effectiveness of Relenza? **2 marks**

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- iii. Non-Nucleoside reverse transcriptase inhibitors (NNRTIs) are also antiviral drugs used to treat HIV as non-competitive inhibitors. Describe how NNRTIs act as non-competitive inhibitors.

**3 marks**

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### Question 7

Milk contains a protein known as casein. When cheese is produced, often acids such as a vinegar, lemon juice or citric acid is added. Discuss why an acid environment contributes to the manufacture of some cheeses. **2 marks**

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