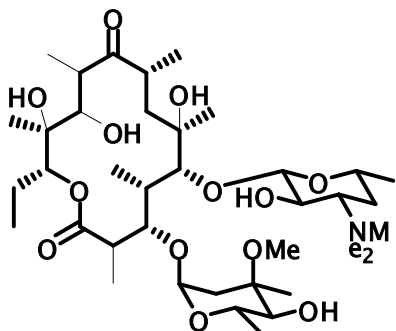


## TESTEXAM 2011

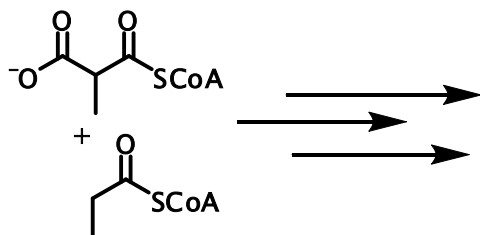
### 1. (15 Points)

a) To which class of natural products belongs erythromycin A?



erythromycin A

b) The biosynthesis of erythromycin A starts with the  $\text{-S-CoA}$  derivatives depicted below. Which enzyme system is responsible for the modular assembly of erythromycin A? Do you know a synthetic equivalent of this type of transformation?



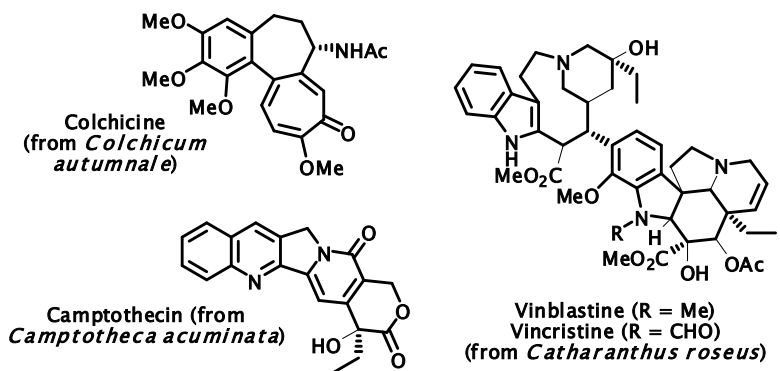
c) Nature builds **flavonoids** and **isoflavonoids** by combining the polyketide metabolism with the so-called Shikimate pathway. Give the structure of Shikimic Acid.

d) What is the skeletal difference between a flavonoid and an isoflavonoid. Give an example of each class of compounds.

### 2. (15 Points)

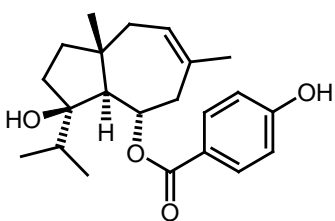
a) Alkaloids are a diverse group of natural products that originate from several different biosynthesis routes. Therefore classification is rather arbitrary. What is the most general characteristic of an alkaloid?

b) To which type (indole-, (iso)quinoline-, tropane-, aromatic-, etc.) of alkaloids belong the natural products depicted below?

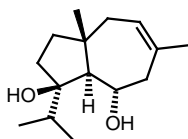


### 3. (20 Points)

Ferutinin (**1**) is an estrogenic compound occurring in some species of the plant genus *Ferula* (Giant fennel). It is an ester of jaeschkeanadiol (**2**).

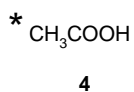
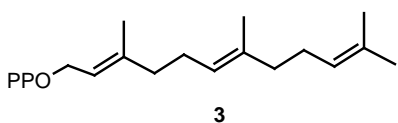


Ferutinin (**1**)

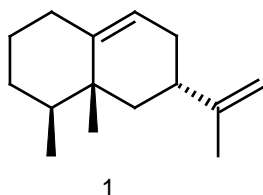


Jaeschkeanadiol (**2**)

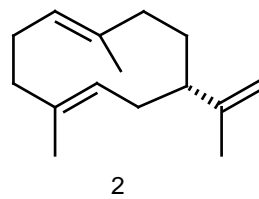
- Show that **2** is a terpenoid using the isoprene rule.
- Suggest how **2** could be biosynthesized from farnesyl diphosphate (**3**) (Note that one of the hydroxy groups is absent in the primary product!)



- If Ferutinin **1** is biosynthesized via the classical mevalonic acid (MVA) pathway from acetic acid (**4**), which carbon atoms in **1** would be <sup>14</sup>C-labelled if **4** carrying a <sup>14</sup>C-methyl group (as indicated by the asterisk) is used as a carbon source?
- Aristolochene (see below) is a component in tobacco odour. It is also synthesized from farnesyl diphosphate (**3**) aristolochene synthase via the monocyclic precursor germacrene A, which is known as an odour component in tomatoes.



aristolochene



germacrene A

Suggest how **1** could be biosynthesized from germacrene A (**2**)